POST OFFICE

tele communications

JOURNAL

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WINTER 1967

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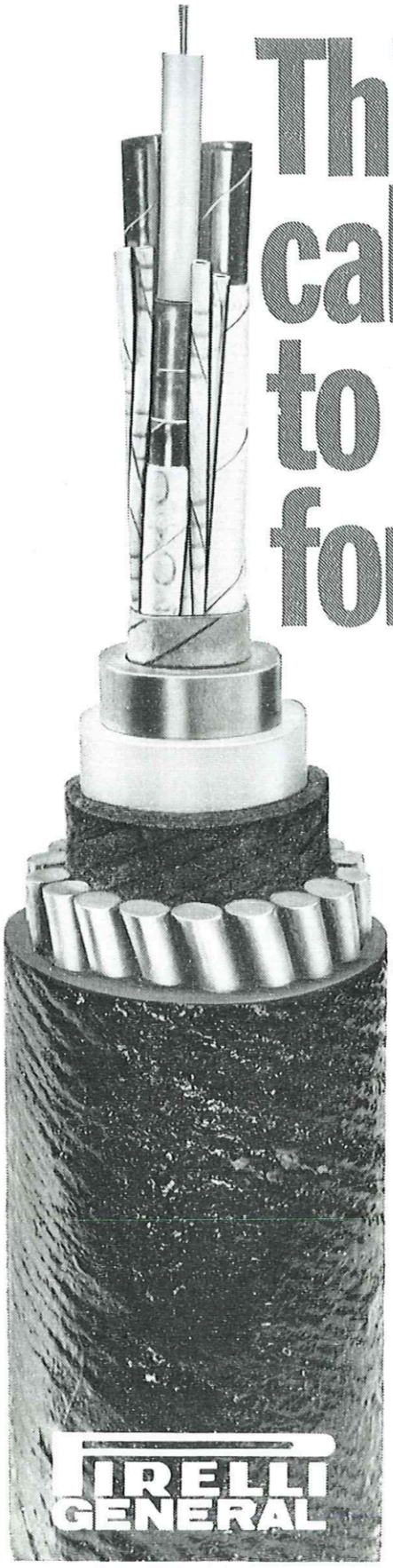

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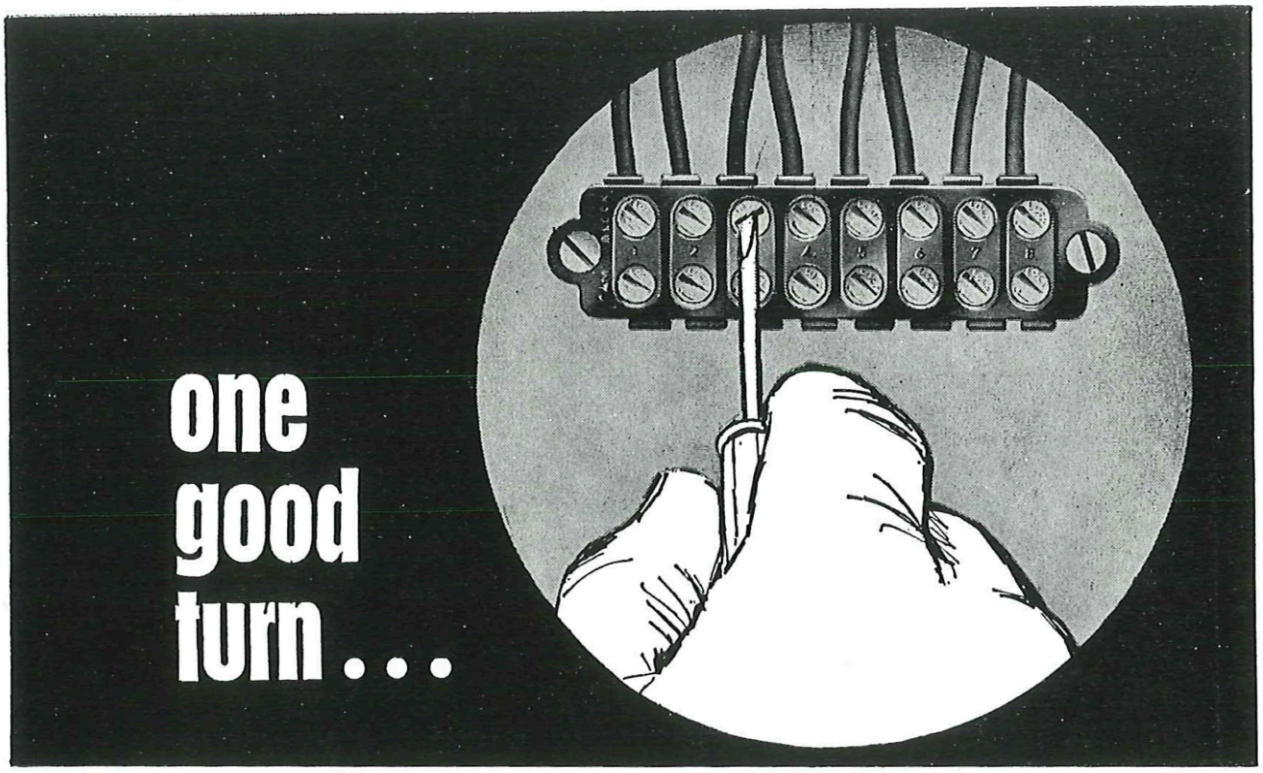

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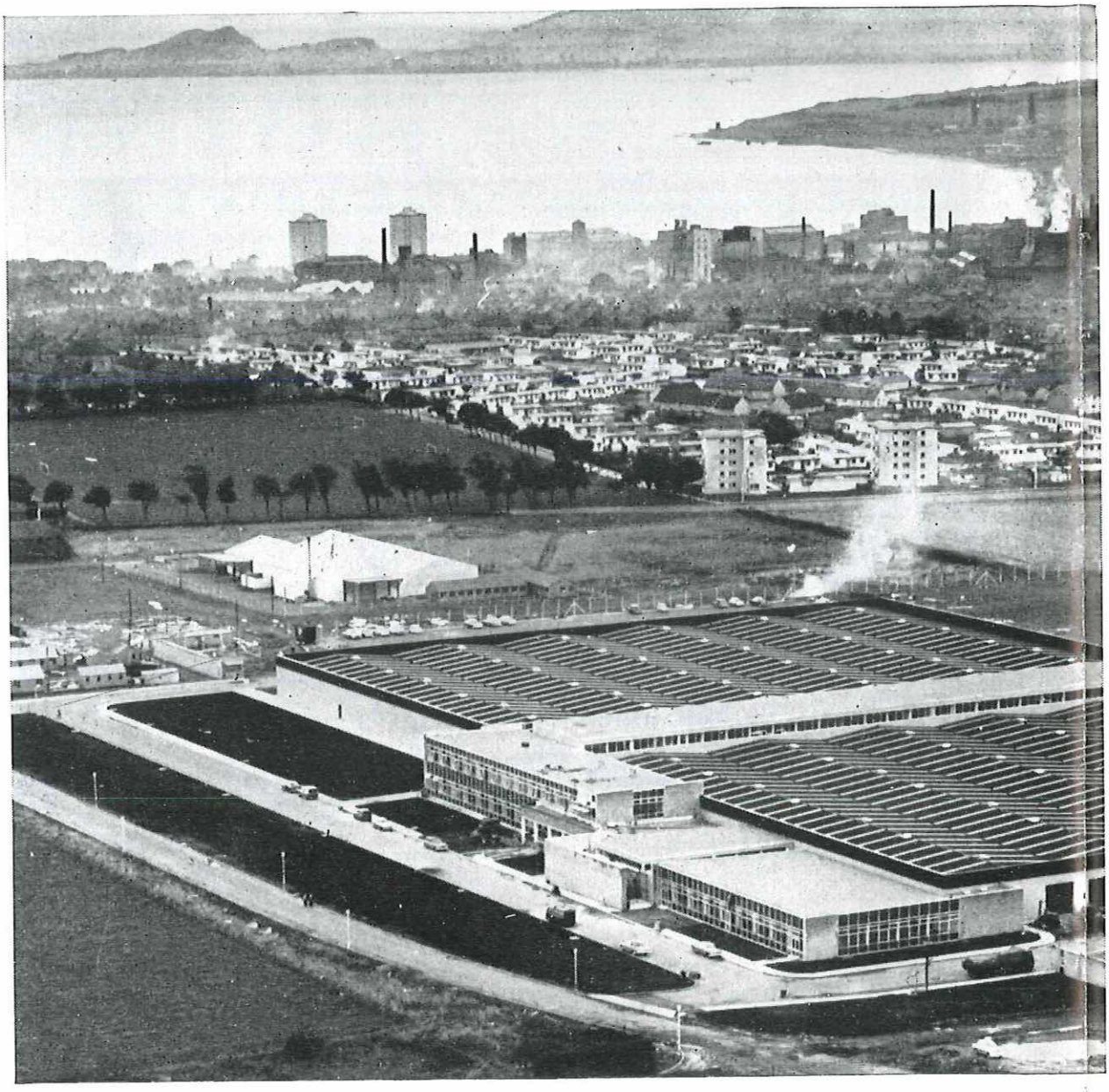

AEI Telecommunications in one year adds a million square feet to its productive capacity to meet BPO demands

The new 258,000 sq. ft. AEI telephone exchange equipment factory at Kirkcaldy, in Fife

A view of the vast rack wiring sections in the new factory at Kirkcaldy.

wo new AEI factories at Kirkcaldy and Glenrothes in Scotland—nother in Lower Sydenham and expansion at Hartlepool. One illion square feet of new factory space added in just 12 months —a significant increase in productive capacity which is already laying a major part in stepping-up the output of AEI's Telecommunications Group to meet the huge demand from the British Post Office.

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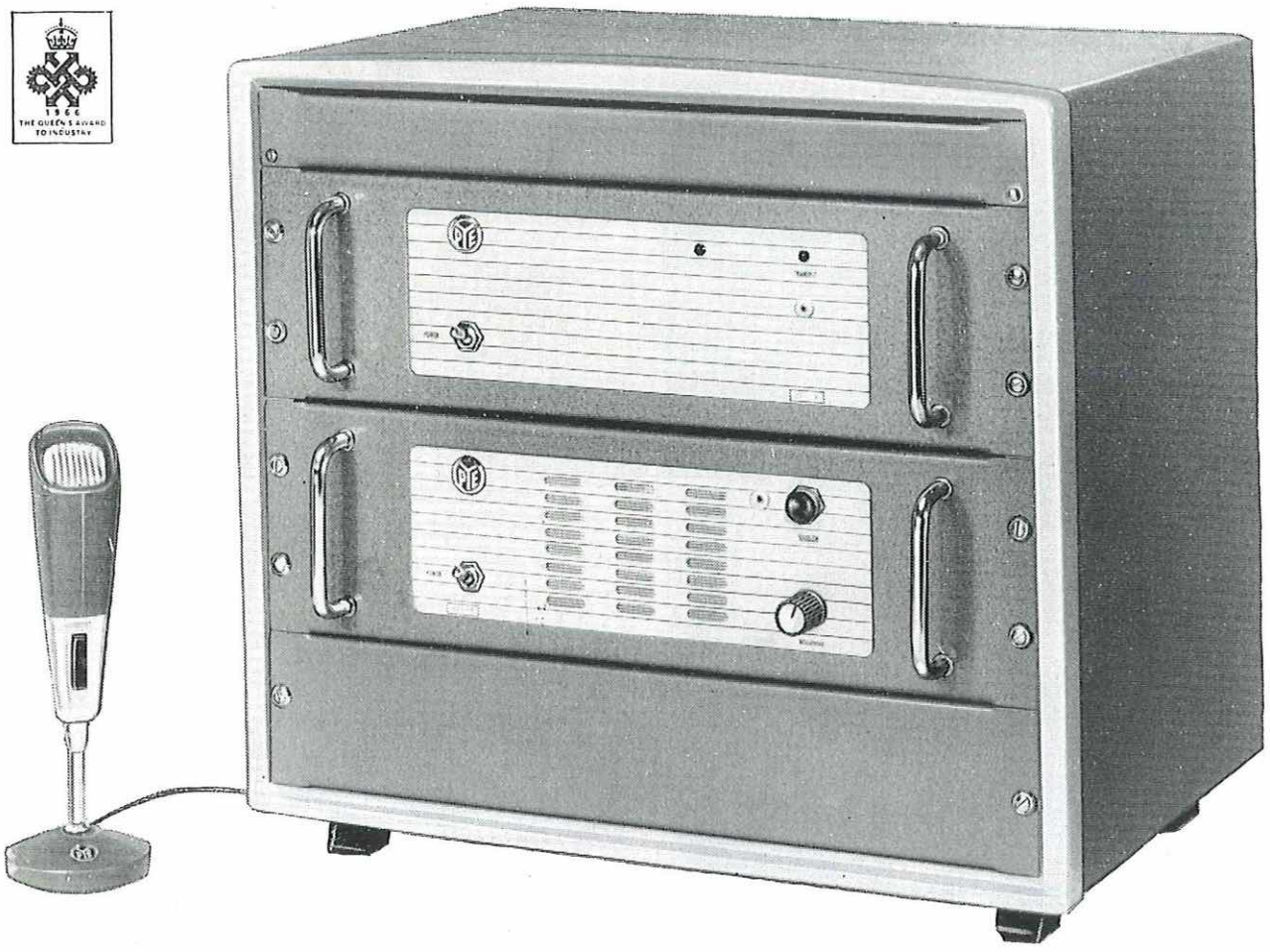

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Post Office Telecommunications Journal

Published by the Post Office of the United Kingdom to promote and extend knowledge of the operation and management of telecommunications

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Vol. 19 Winter 1967 No. 4

The new target

TWO important and closely-linked developments vitally affecting the Post Office took place in November.

The first was the announcement that as from 1 April, 1968, there will be two separate financial targets for posts and telecommunications. The new telecommunications target will be a net return of 8½ per cent on net assets against the present target of 8 per cent. Such an increase might seem trivial. In fact, a rise of ½ per cent would have meant the need to make an additional profit of some £7½m in 1966-67. This added requirement will grow as large increments of capital are added to the business.

The second development was the publication of the White Paper on Nationalised Industries which approaches financial objectives by way of investment, prices and costs and emphasises the importance to the national economy of sound handling of the huge resources commanded by the nationalised industries.

It demands that investment projects should be properly appraised by modern techniques and that normally they should show a return of 8 per cent as a minimum. It emphasises that sound pricing policies are an essential complement to investment appraised, that they must in general cover costs and also be used to promote the efficient use of resources, and that in future all price changes must run the gauntlet of the National Board for Prices and Incomes.

It also points out that since efficiency and cost saving are highly relevant to pricing policies, the NBPI is entitled to inquire into the efficiency of industries whose proposals for price increases are referred to it.

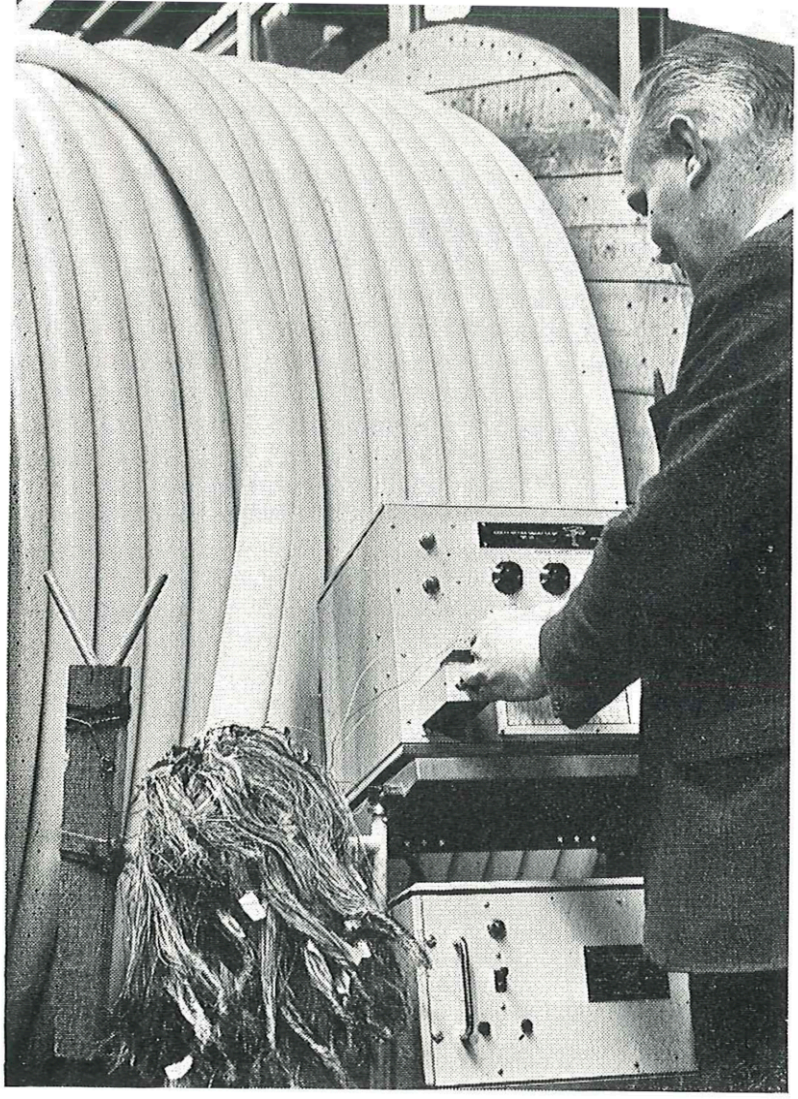
Against this background, the new targets are meant to reflect sound investment and pricing policies after allowance has been made for historical peculiarities and social obligations.

A financial objective influences pricing which has a direct effect on demand and hence on investment requirements. At the same time it sets the profitability level and determines the contribution an industry can make towards financing its own capital needs. If an industry grows rapidly its capital expenditure rises and its degree of self-financing tends to fall. If that tendency becomes too marked there is at least a *prima facie* argument that its goods or services are underpriced.

In the telecommunications services the percentage of self-financed capital expenditure has declined from 70 per cent in 1963-64 to an estimated 44 per cent in 1967-68 during a period in which the return on capital has itself declined steadily from 8·8 per cent to just over 7 per cent.

The new target will be hard to attain and the recent devaluation of the £ and new Government policies of retrenchment and restraint may make it even more difficult. Even if, as is now admitted, some of the telecommunications prices are too low and need adjustment there is no question of living up to the new standard by putting prices up every year or so. This would be unacceptable both to the Post Office and its customers and contrary to Government policy.

What is required is the unremitting pursuit of efficiency and economy year in and year out. That is the real meaning and challenge of the new target.



An engineer testing the new telephone cable which contains more pairs than ever before, accommodated in a single cable suitable for installing in a GPO standard duct.

A WORLD RECORD CABLE

By L. D. W. KOTTRITSCH

AN EXCITING newcomer to the world of telecommunications is an underground cable containing 4,800 pairs of wires packed into a 2.79-inch diameter space and insulated with solid polythene only three-thousandths of an inch thick.

This new cable, which the Post Office plans to introduce as soon as possible into the local network throughout the country to alleviate congestion on duct routes, is almost certainly the biggest pair size cable of its kind in the world. Until now the Japanese held the record with a cable of 4,000 pairs. The previous limit for British Post Office local network cables was 3,200 pairs.

Post Office engineers have been carrying out exhaustive tests of the new cable which will first be used at Ravensbourne Exchange, Bromley, in Kent. It has been designed and developed to Post Office specifications by Standard Telephones and Cables Ltd.

By cramming a maximum number of pairs into a minimum space, the new cable matches the developments achieved in miniaturising telephone equipment installed in exchanges and provides engineers with a welcome answer to the immediate problems of congested duct routes in the vicinity of telephone exchanges.

Reduction in the size of exchange equipment has increased the traffic handling capacity of exchanges to a degree never foreseen when the exchanges were built. But this, in turn, is rapidly exhausting the duct space at the point where cable enters an exchange, although there is still often more room available in the exchange for more equipment. In short, the big problem is how to meet the urgent need for additional cable to be inserted into already over-crowded duct routes.

The simple answer might appear to be to augment the ducts to take extra cables. But this is not always possible or desirable; for instance at Ravensbourne Exchange, where a new lead in is to be built on the opposite side of the exchange to the existing one, any augmentation of the main duct route now in use would be wasted.

The real answer lies in getting rid of the old large-gauge cables which contain comparatively few conductors and replace them with the new and smaller-gauge cables which have many more conductors.

Ravensbourne Exchange is typical of many

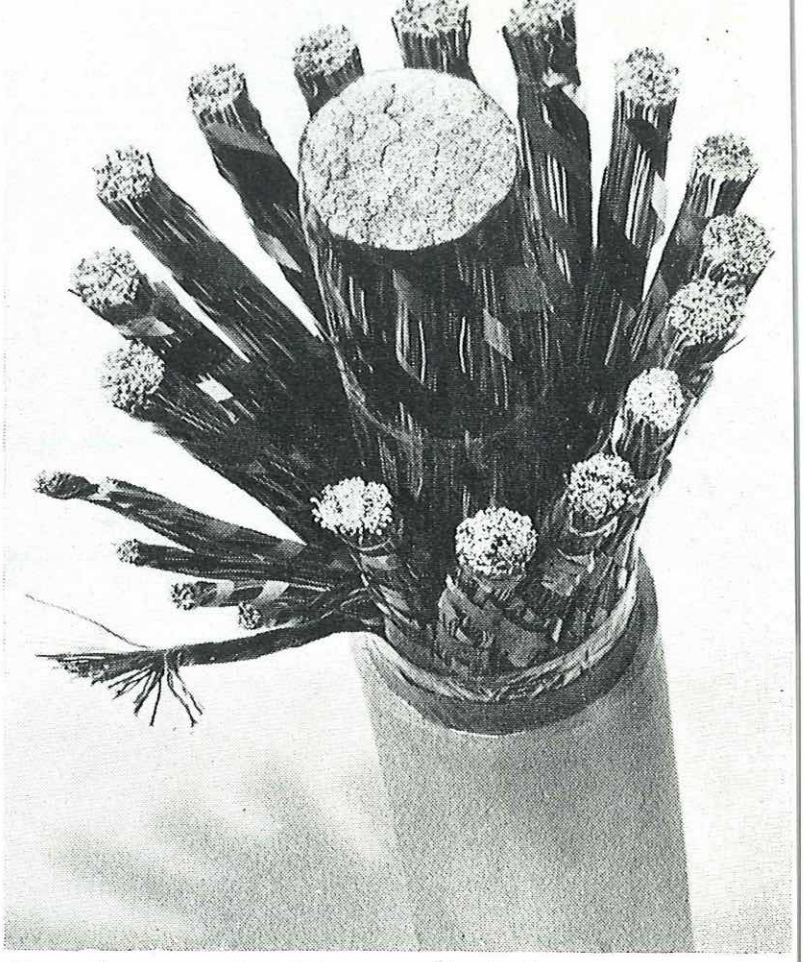
exchanges where the introduction of the new cable will have beneficial results. It serves an area of about five square miles and already contains more than 12,000 working lines—a figure which is expected to increase to 17,000 by 1971, 24,500 by 1976 and 28,300 in 1981. The existing telephone equipment will not be augmented until 1971 when a new distribution frame and lead in will be installed. It will be necessary, however, to provide for another 5,400 subscriber circuits and more than 2,500 junction circuits within the next four years, although both the existing distribution frame and the 27-way duct route serving the exchange are exhausted.

When the new cable is introduced at Ravensbourne it will terminate on new-type terminal blocks which allow twice the number of conductors to be accommodated on each vertical section of the frame. Thus, the life of the frame will be extended while spare bores in the main duct outside the exchange are being created. Only two 4,800-pair cables instead of three 3,200-pair standard cables will be needed and this will save an estimated £2,000.

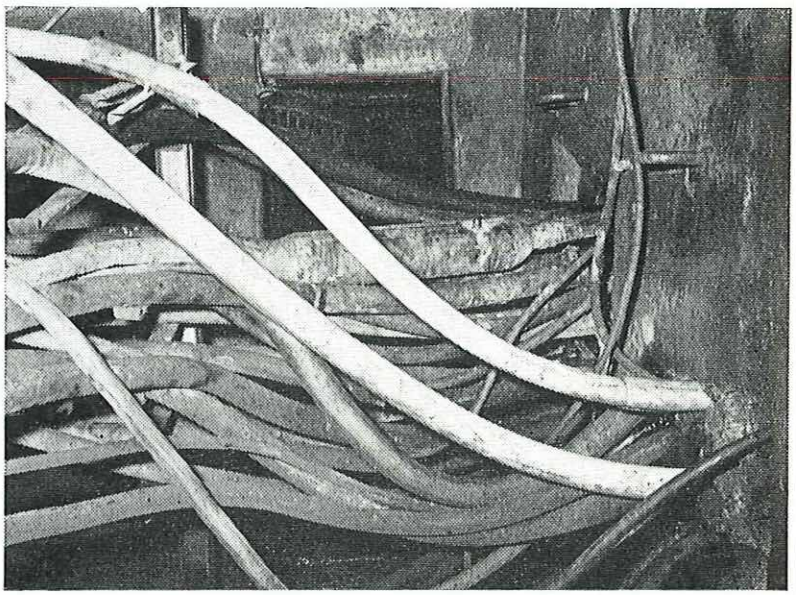
The Mansion House Exchange, in the City of London, provides another example of extreme conditions demanding a drastic remedy. One of the main duct routes from the exchange, containing 51 bores with only one spare in some sections, runs under Eastcheap towards the junction with King William Street. So also does the underground District Railway which occupies most of the space under the street down to a depth of about 32 feet. Surface drains, sewers, water mains, gas mains fire hydrant feeds, electric supply cables and pneumatic tubes all compete with telephone cable duct routes for the very limited space available. The provision of any further duct routes in these conditions is highly undesirable if not almost impossible.

Restricted space has also meant using manholes which are both small and of a shape that makes working in them difficult and uncomfortable. One such manhole—about 12 feet long and 12 feet wide— has a cambered floor which is also the roof of the underground railway. This allows only about five feet headroom to the boiler plate roof supporting one of the main traffic routes from the London Docks. The vibration of 20-ton lorries overhead and underground trains immediately below is hardly conducive to the high standard of work expected of telephone engineers.

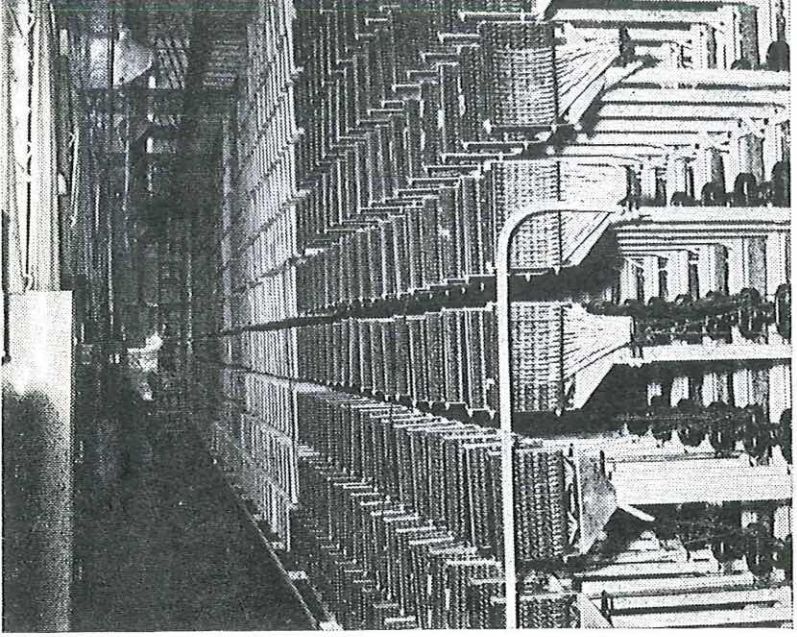
OVER



Above: A cross-section of the new cable. Each wire of the 4,800 pairs can be identified by means of a coloured code and each unit by coloured tapes surrounding the units.

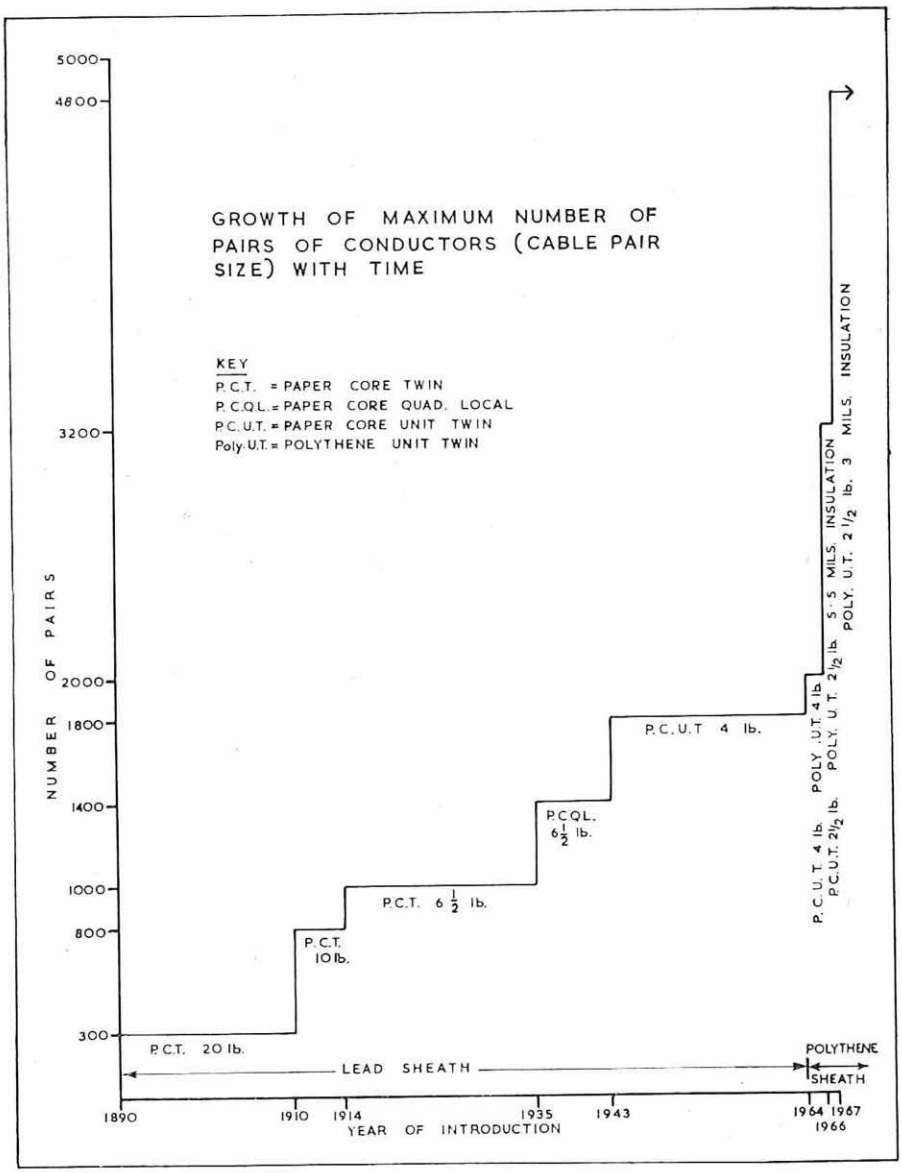


Above: A tangle of cables in a manhole in the Ravensbourne Area showing part of the congested 27-way route leaving the exchange.



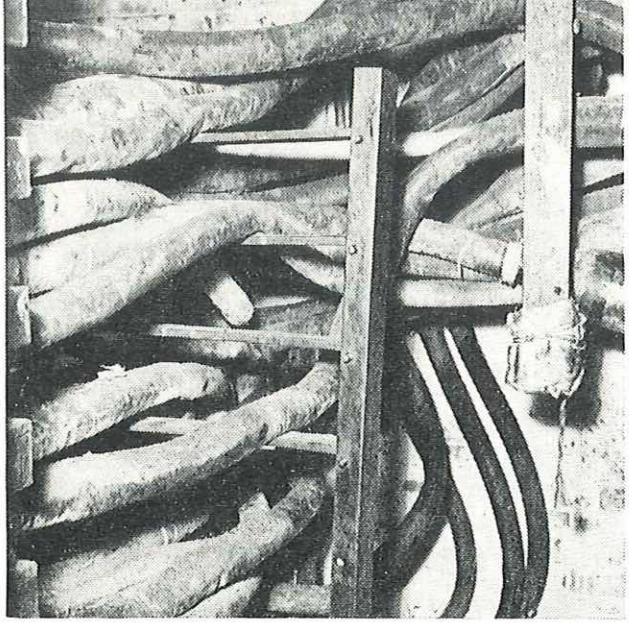
The main distribution frame at the Ravensbourne Exchange showing in the foreground the vertical sections fitted with the new-type terminating block which enables the capacity of the frame to be doubled.

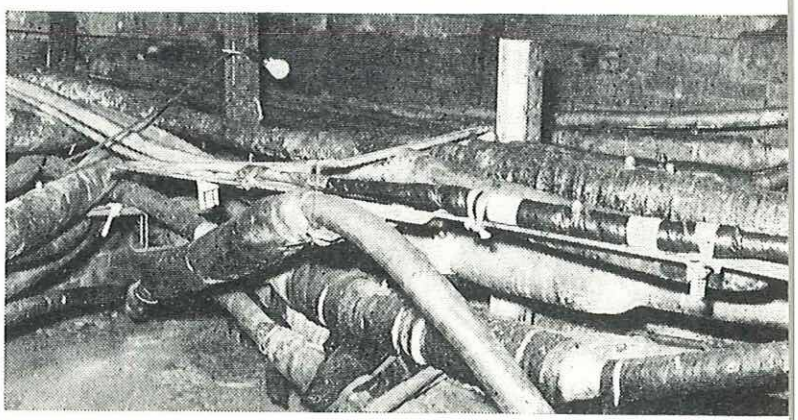
Over this highly congested route, a further 12,000 cable pairs will be required to meet the demand for telephones in the near future. And this does not include the thousands of cable pairs required to interconnect telephone exchanges. How will this be achieved? The answer again lies in the use of large pair size cables. Starting with the one spare bore available, a 4,800-pair $2\frac{1}{2}$ lb-a-mile conductor cable will be installed, and circuits working by way of two 1,000/$6\frac{1}{2}$ lb and one 1,400/$6\frac{1}{2}$ lb. cable will be diverted to work over the new cable. This allows the three old cables to be recovered, giving three spare bores



This diagram shows how the number of pairs of conductors in local cables has increased since 1890.

Right (top): A complicated knot of cables in one corner of the cable chamber at Mansion House Exchange. Below: Part of a manhole in Eastcheap, the floor of which is the roof of London's Underground District Railway.





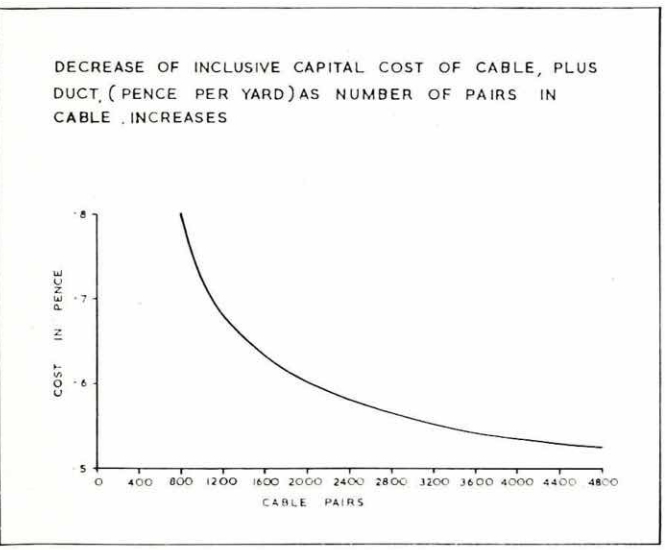
in the route and providing 1,400 additional cable pairs.

This type of operation will be repeated to create further spare duct capacity together with cable pairs for relief. It is estimated that without adding any more duct, sufficient bores and pairs can be made available at a rate which will allow the expected growth of telephone lines to be maintained.

One of the many difficulties encountered in this type of change-over—especially in a city—is that there are many private circuits and extensions rented by subscribers which require a heavier gauge conductor to allow sufficient current to operate some of the equipment. This demands an extremely careful check of the circuit records by the Post Office Engineering Planning Staff and the very careful re-routing of certain circuits on to pairs made spare in one of the existing cables containing heavier gauge conductors. All this makes the change-over to the new cables a very complicated and exacting operation.

In these examples, the application of large pair size cables in the local line network have been in the nature of expedients, but these cables have a rightful place on the basis of standard economics. It costs money to provide a duct into which cable pairs will be installed. Hence, the greater the number of conductors within each duct, the smaller is the inclusive capital cost of cable and installation, together with that part of the cost of the duct bore apportioned to each cable pair. The cost of installing a cable pair of a 4,800 pair cable is about three per cent less than that of a pair of 4,000 pair cable.

Diagram showing the decrease in inclusive capital cost of cable and duct—in pence per yard—as the number of pairs increases.



Every effort is being made to meet the rapid growth of the telephone service by the most economic means, using advanced techniques and equipment. By thinking on this scale and by initiating the design of advanced equipment to be used with increasingly efficient methods, the telecommunications side of the Post Office will meet the challenge of providing an even more efficient telephone service under the stimulating conditions of a Public Corporation.

THE AUTHOR

Mr. L. D. W. Kottritsch, is an Assistant Executive Engineer in the Local Lines Branch of the Engineering Department, concerned with organising field trials of experimental cables, the introduction of Long Length Cabling, and the planning and implications of all new types of local line cables. He joined the Post Office in 1946 as a labourer.

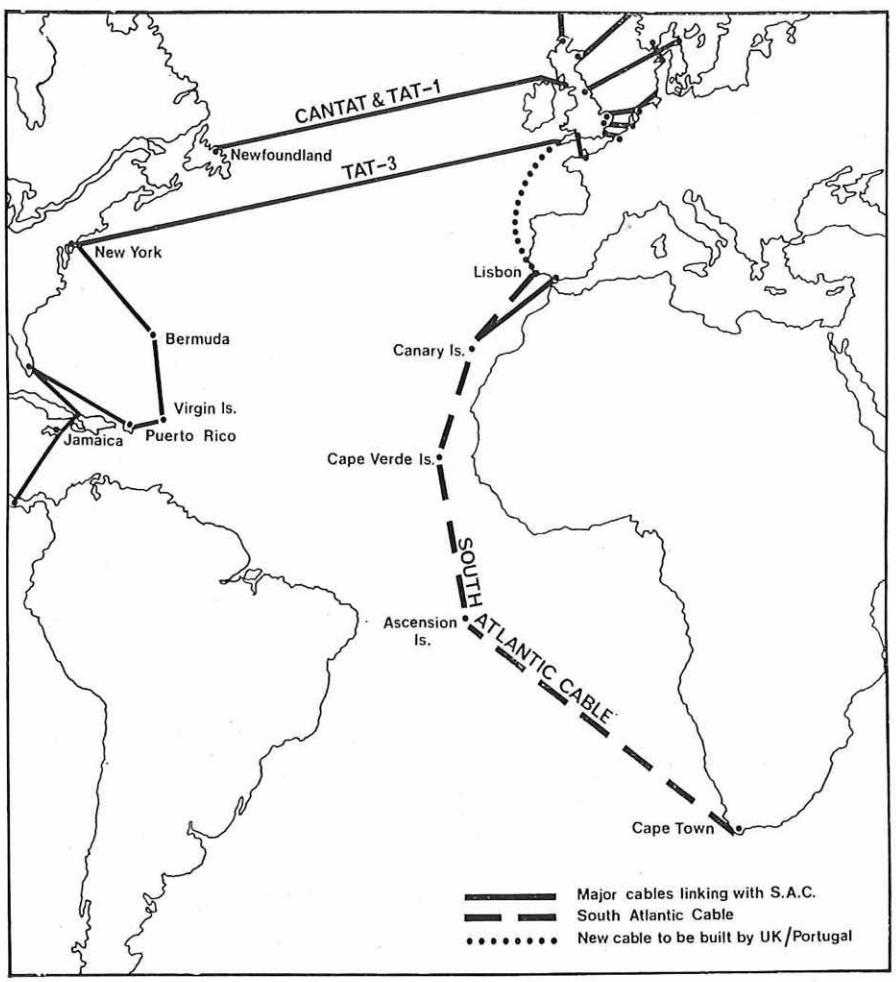
FOUR NEW LINKS ACROSS THE SEAS

IMPORTANT developments are taking place in the world of submarine cables, with the Post Office, Cable and Wireless Ltd and British manufacturers all playing a leading part.

1

On 25 October the Cable and Wireless Ltd cable ship *Mercury* left Southampton loaded with 1,260 nautical miles of deep-sea, lightweight cable, 55 nautical miles of armoured shallow water cable and 149 repeaters and equalisers, to carry out the first lay of a new submarine cable link between South Africa and Europe.

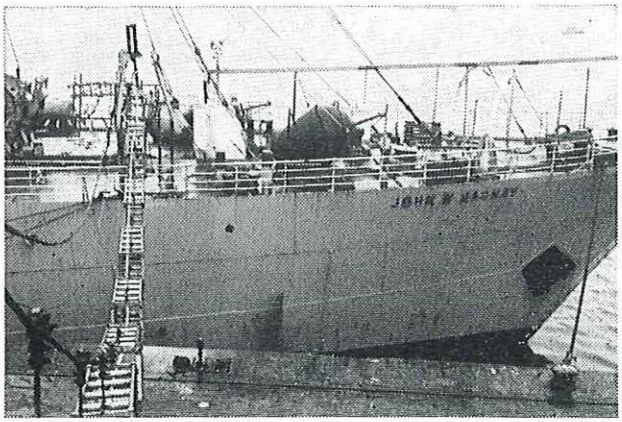
The new 6,000 nautical mile cable link, which will cost £22 million, will be capable of carrying 360 simultaneous two-way telephone conversations. It will link Cape Town with Lisbon and have intermediate landing points at Ascension, Cape Verde Island and the Canary Islands where some channels will inter-connect with Spain by



This map shows the routes of the new cables which will be laid from Portugal to South Africa and from Lisbon to Cornwall.

way of a cable laid in 1965. At Lisbon, it will have access to a high-capacity cable to be laid between Portugal and Cornwall—a joint project by the British Post Office and the Portuguese PTT.

The Cape-Town to Lisbon cable scheme is expected to be completed by the end of December, 1968. Cable, repeaters and terminal equipment are being provided by Standard Telephones and Cables Ltd.



Right: A flexible gantry feeds cable into the holds of the C and W Ltd's John W. Mackay *which will lay the shore ends of the South Atlantic cable at Johannesburgh and Ascension Island.*

* *

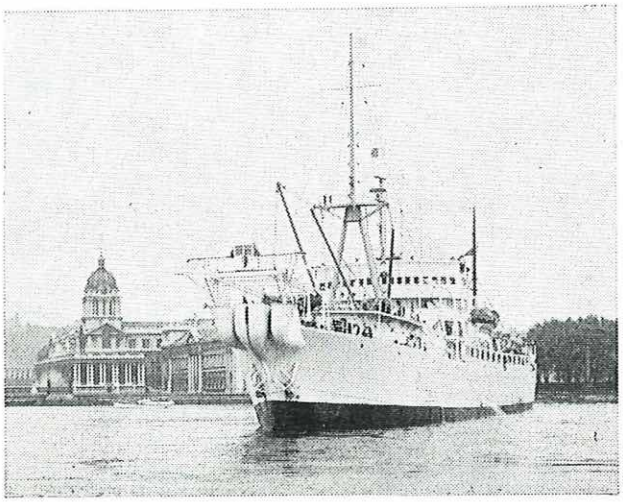
2

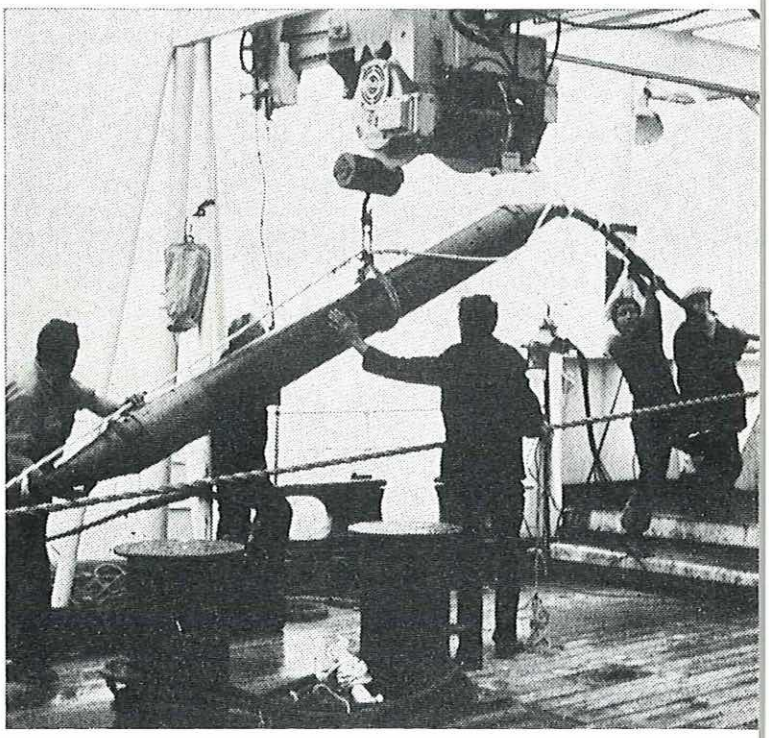
The world's first wideband submarine telephone cable system was brought into operation on 9 October between Norway and Denmark. The British Post Office cable ship, HMTS *Monarch* laid the 80 nautical mile cable, which was designed and manufactured by Submarine Cables Ltd, who also produced the ten submersible transistor repeaters.

This new cable will provide 480 (4 kc/s) circuits but is capable of handling 640 (3 kc/s) circuits.

In the coming months, Submarine Cables Ltd will be supplying some 1,000 nautical miles of cable for service in the North Sea, the Baltic and the English Channel, followed by a further 1,000 miles for the Mediterranean and Atlantic.

OVER





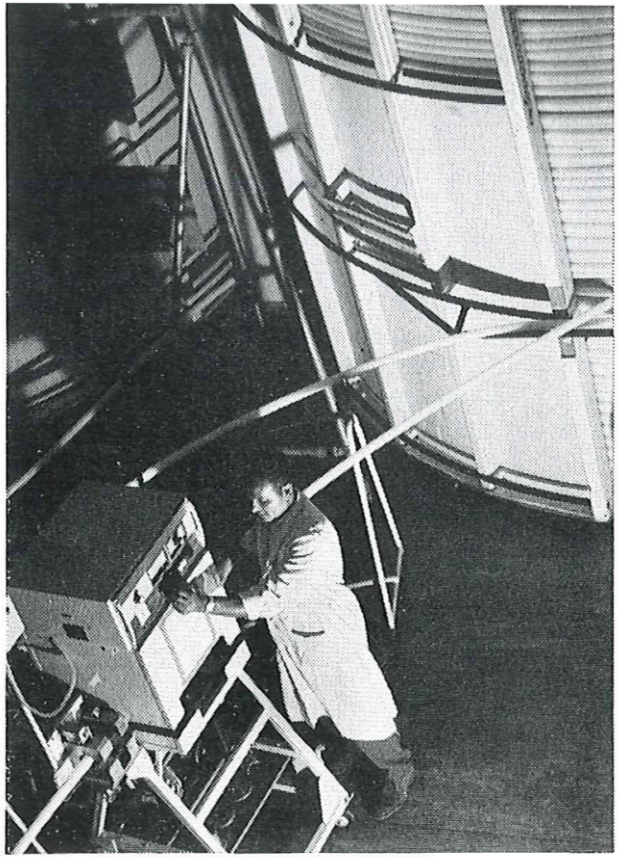
Above: The Post Office cable ship HMTS Monarch *steams past the Royal Naval College at Greenwich before leaving to lay the Norway to Denmark telephone cable. Right: Well out into the North Sea,* Monarch's *crew manouevre a repeater into position over the bow. The new Norway to Denmark cable has ten repeaters.*

3

A new design of one-and-a-half-inch diameter submarine cable which will have the highest capacity of any submarine cable yet in operation, is to be used for the 1,350 nautical mile cable system between Jacksonville, Florida and St. Thomas, in the Virgin Islands.

Scheduled for completion in the summer of 1968, the new cable will be able to carry 720 simultaneous two-way telephone conversations over 3 kc/s channels. Transistorised repeaters will be laid at ten-mile intervals.

The new cable is being made at Standard Telephone and Cables Ltd's Southampton factories where a heavily-armoured version for use at the shallow-water shore end is also being manufactured.



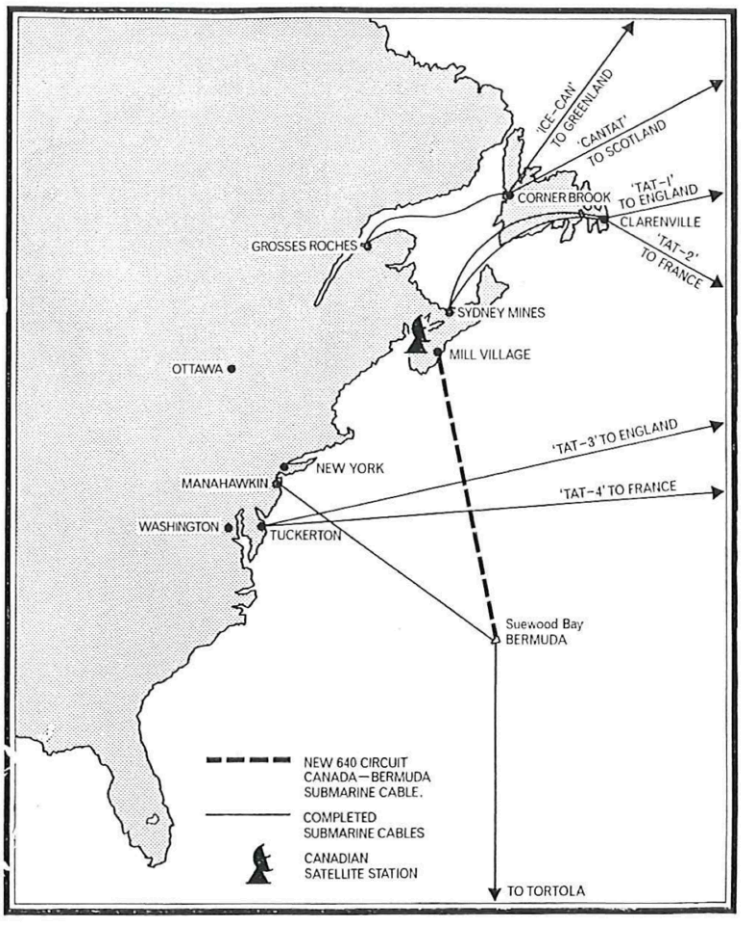
Right: An inspector examines the new cable with an X-ray apparatus. At this stage the outer copper conductor has yet to be added to the cable.

* *

4

An 800 nautical mile deep-sea submarine telephone cable system—to be known as CANBER—is to be laid between Nova Scotia, Canada, and Bermuda. It will have 480 circuits and a maximum capacity of 640 telephone circuits and is expected to be completed in 1969. It will be laid by the Cable and Wireless Ltd cable ship *Mercury*.

The total cost of the scheme will be about £4½ million.



Right: Map shows the 800 nautical mile cable which will be laid by 1969 from Mill Village, in Novia Scotia, to Suewood Bay in Bermuda.

Cutting down on cable types

THE Post Office has embarked on a plan to rationalise the sizes and types of cables it uses. At present, more than 400 distinguishable versions of external cable are being ordered—no fewer than 120 of them being different types of cable solely for the local cable network.

Making this announcement when he recently opened a new factory at Southampton owned by Pirelli General Cables Ltd, one of the Post Office's large suppliers of cable, the Postmaster General, Mr. Edward Short, said that the Post Office would like to be able to reduce the number of local network cables to 50 and similarly to reduce the number of types of main and trunk cable.

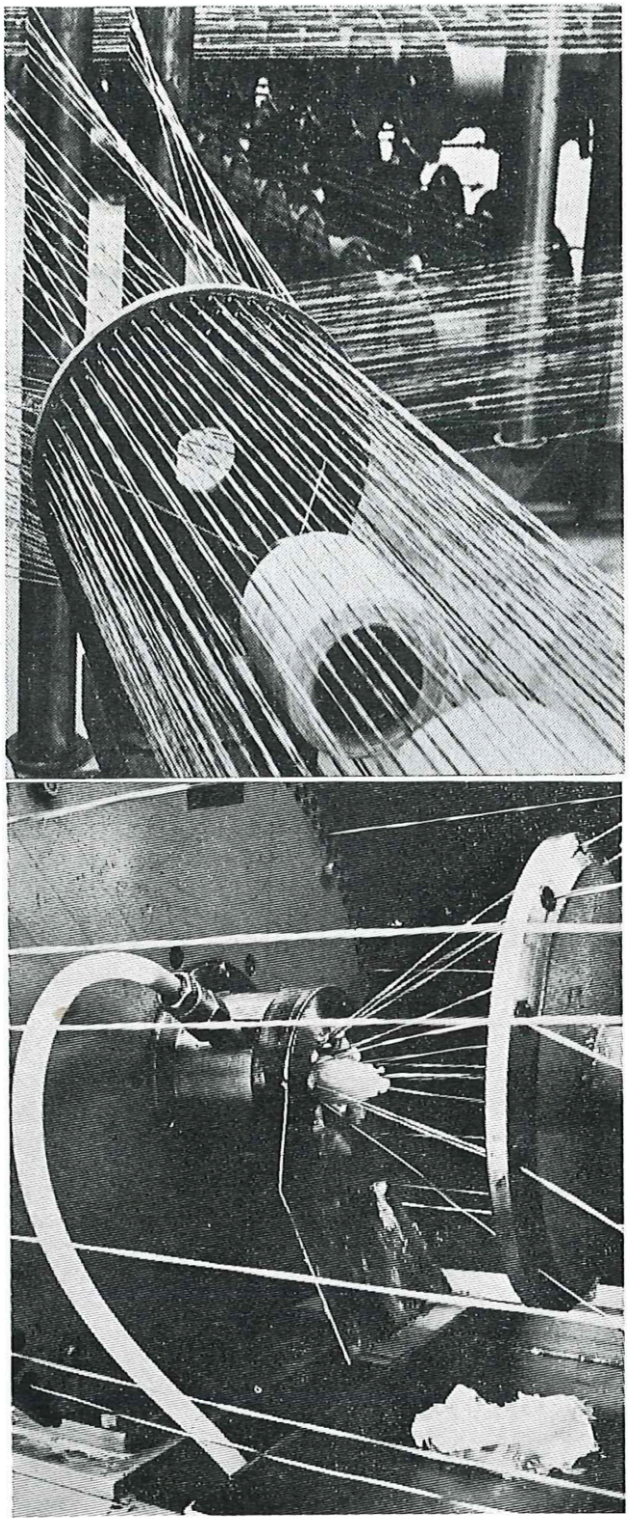
Mr. Short assured his audience that despite technological advances such as the microwave radio network and pulse code modulation, the Post Office expected the level of demand for cables to remain at or near the current levels for the next decade.

The Post Office and industry had not been slow to exploit new and cheaper materials for cables. For example, polythene had almost completely replaced lead as a sheath and was now challenging paper as an insulation material .

The Post Office, said Mr. Short, is continuously reviewing every aspect of design, specification and procurement policy, searching for production or material economies without reducing the reliability and performance of the cable.

"The British cable industry leads the world in many ways. Our cable designs are the most economic in material usage and service reliability and the many problems concerned with cable life, with which the rest of the world is still grappling, are nearing solution in Britain."

The new factory which the Postmaster General opened is producing three basic products: paper insulated twin distribution cables, plastic-insulated twin distribution cables and coaxial cables.



Right (above): At Pirelli's new factory the twinned cores of a cable are shown being assembled into units of 50 pairs on special paper-bunching machines. Below: Polythene-insulated cables are similarly treated. Here, a cable undergoes plastic bunching.

A YEAR OF CHALLENGE

For telecommunications, the year 1966-67 was a good one in many ways. Although the profit fell slightly, there were a number of outstanding achievements in the face of difficulties. But many problems remain to be overcome, notably congestion and shortage of equipment

An engineer at work on some of the latest trunk signalling relay equipment at the International Exchange, London. This and similar equipment is helping to cope with the rapidly rising number of ISD and STD calls.

THE year 1966-67 was predominantly one of self-examination and change aimed at equipping the Post Office better to meet the challenge of providing the nation with a fully modern, efficient and comprehensive communications system in an era when the pace of technological progress is increasing more rapidly.

This is the verdict of the Post Office Report and Accounts on the activities of the Post Office in the 12 months ended on 31 March, 1967.

Here are the details of the telecommunications services achievements and some of its plans for the future:

GROWTH OF THE SERVICES

The number of telephones in use rose to nearly 11.3 million. The number of connections increased by 398,000 to 6.93 million. The waiting list increased by about 19,000 to over 115,000 mainly because of the continuing shortage of exchange equipment in some areas. Almost all the increase occurred in the first three months of the year. The average time taken to complete orders when plant and equipment were available was three weeks.

More calls

The number of local calls increased by more than 6 per cent to 6,450 million and trunk calls by more than 10 per cent to 930 million. Overseas telephone calls rose from 7.6 million to 9.27 million.

More manual exchanges

During the year 86 manual exchanges were converted to automatic working. By the end of March, 1967, automatic local service was available to 95 per cent of subscribers. STD was further extended to 263 exchanges and was now available to 4.8 million subscribers—70 per cent of the total.

More local lines and trunk circuits

More than 700,000 additional lines were added to the local networks—10 per cent more than in

AND CHANGE

the previous year—and some 7,000 long-distance circuits and 58,000 shorter circuits to the trunk network. Even so, it was not possible to clear congestion from all parts of the system.

A start was made on 215 new buildings and extensions and contractors began installing equipment for 100 major new telephone exchanges and 294 extensions in existing exchanges.

Shortage of equipment

Equipment shortages continued to limit expansion and improvement in the quality of service. The telecommunications industry expanded its productive capacity very considerably at short notice, almost doubling output in three years. But there were serious delays in deliveries which hampered the running of the service. Greatly increased output is expected in 1967-68.

IMPROVING THE SERVICE

Better quality

The policy of giving priority to improving the service for existing customers had a good effect. The drive for better service was helped by a lower rate of growth in calls—which reduced congestion—and by some easing in recruitment—which helped to improve the operator service. There was a significant improvement in the average time-to-answer figures in the operator services and the quality of the local automatic service and of the STD service was also better.

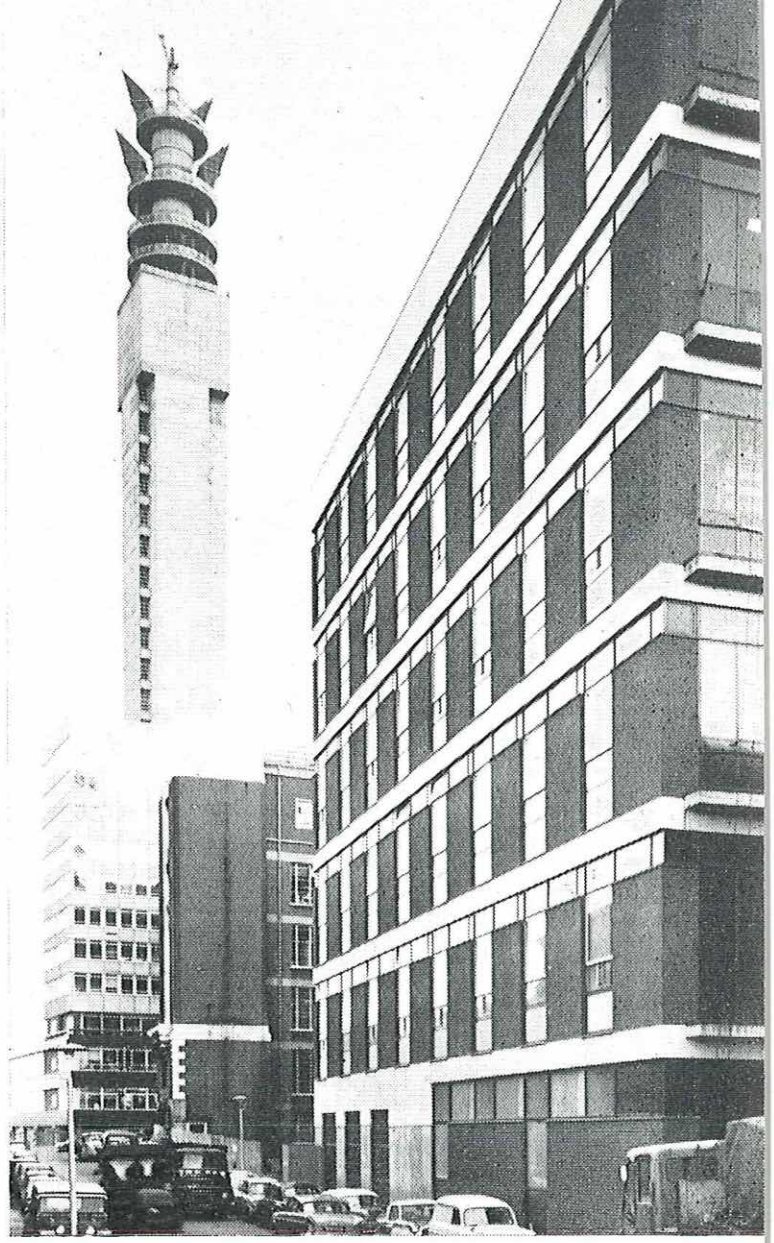
A number of experimental fault report centres were set up to improve the speed of repair and maintenance.

International Subscriber Dialling was further extended and subscribers dialled 4.5 million calls —49 per cent of all the international calls made from Britain.

The first of a new series of combined alphabetical and classified directories was issued in the Brighton Telephone Area.

Telex to 18 countries

The Telex Service expanded rapidly and subscribers can now dial calls to 18 countries. A new teleprinter with additional facilities is now on trial.



Part of the recently-completed extension to Telephone House, Birmingham. In the background is the new Post Office Tower, one of a network of microwave relay stations which the Post Office is setting up throughout the country.

More Datel stations

The number of Datel stations increased by some 50 per cent to about 1,200 and further rapid expansion is expected. Several large, multi-point data networks for the major banks are now being installed. When completed, each network will enable a central computer installation to collect data from, and send it to, up to 2,000 branches.

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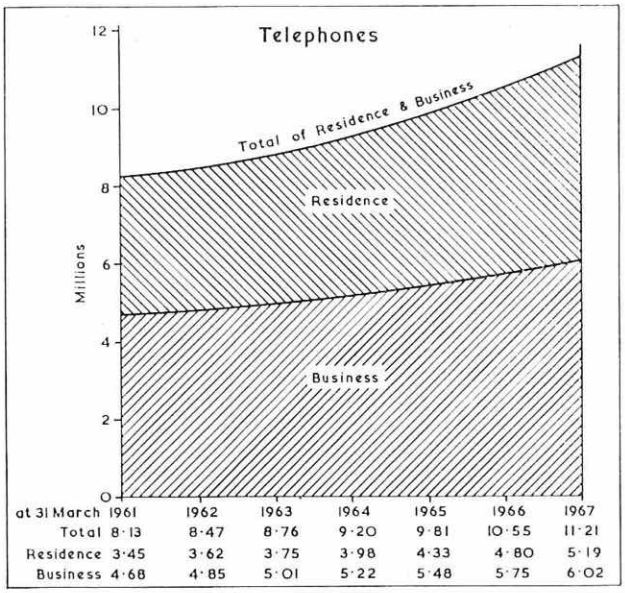
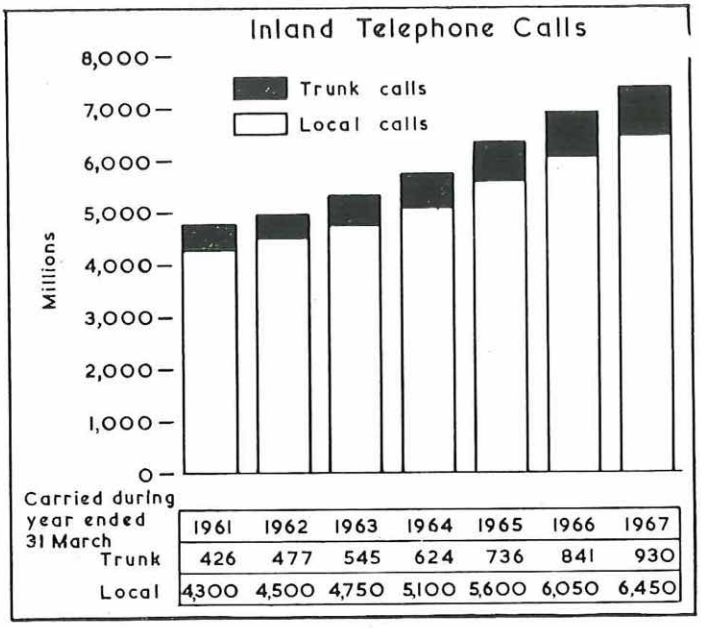


This graph shows how the number of telephones has increased over the past seven years from 8.13 million to 11.21 million.



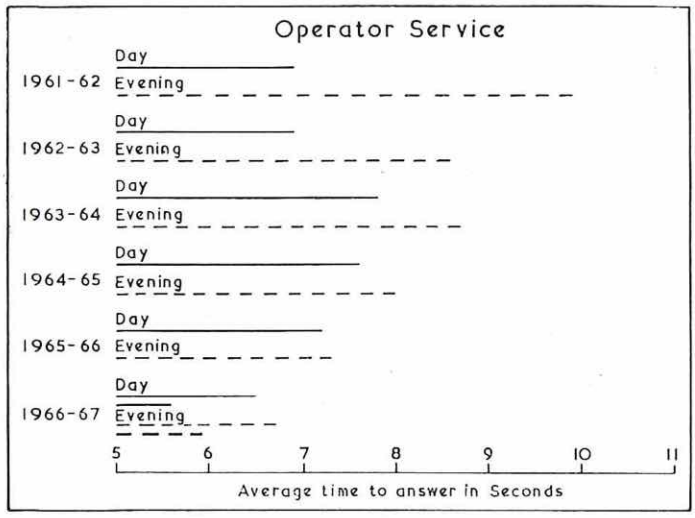
Above: Diagram shows the growth of inland trunk and local calls since 1961. Right: Overseas telephone calls in 1966-67 went up by nearly 23 per cent compared with the previous year.

IMPROVING EFFICIENCY

Marked progress was made in achieving greater efficiency through the adoption of better managerial techniques, higher productivity and the development of more advanced types of plant.

Manpower savings

Improved use was made of manpower—particularly on installation and maintenance work. As a result of changing in staffing arrangements for maintaining automatic exchanges, the total engineering manpower increased by only 2.6 per cent working at a reduced overtime level, even though the system grew by 6.3 per cent. Similarly, despite the need to redeploy installation staff to other work because of the reduced demand for service, efficiency continued to improve and 7,500 more telephones were installed than in 1965-66 by 1,200 (seven per cent) fewer staff. But for these improvements 5,700 more men would have been needed than were in fact employed.



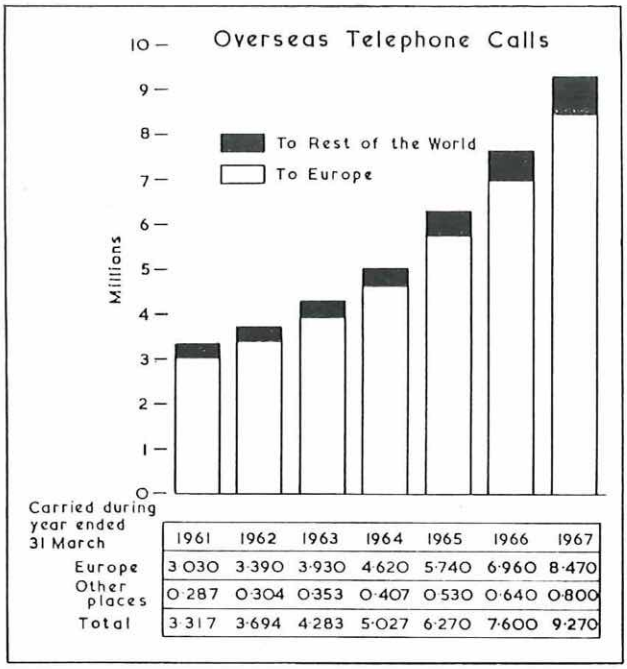
O and E successes

In addition to the normal day-to-day efforts of management generally, the Organisation and Efficiency Branch of the Inland Telecommunications Department obtained improvements worth more than £500,000 a year, with about ten times this amount in prospect.

New computer centres

Considerable advance was made in developing telephone computer billing for general application. Three new computer centres were set up and work is going ahead on other projects, including the use of computers for providing telephone service, controlling stores, payroll and compiling telephone directories.

This chart shows the significant improvement recently achieved in the operator service.



Carried during year ended 31 March

	1961	1962	1963	1964	1965	1966	1967
Europe	3·030	3·390	3·930	4·620	5·740	6·960	8·470
Other places	0·287	0·304	0·353	0·407	0·530	0·640	0·800
Total	3·317	3·694	4·283	5·027	6·270	7·600	9·270

Electronic exchanges

The first production electronic exchange in the world in the small to medium size range was brought into service at Ambergate. A further 44 orders for this type of exchange were placed. A large electronic exchange has been developed and an installation is nearing completion for public service trials. Trials on a third type of electronic equipment—for extending and partially replacing existing Strowger-type electro-mechanical exchanges—began in January, 1967.

Expanding the trunk network

Many more high-capacity coaxial cables and micro-wave radio relay links were brought into operation in the trunk service. Substantial amounts of pulse code modulation equipment are being ordered to expand the capacity of the short-distance network.

FUTURE DEVELOPMENTS

A Long Range Systems Planning Unit was set up to study the impact of new technologies on the telecommunications system and determine the pattern of the network which will emerge in the late 1970s.

At present the greatest emphasis is being placed on the inter-relations between evolving electronic exchange systems and developments in digital

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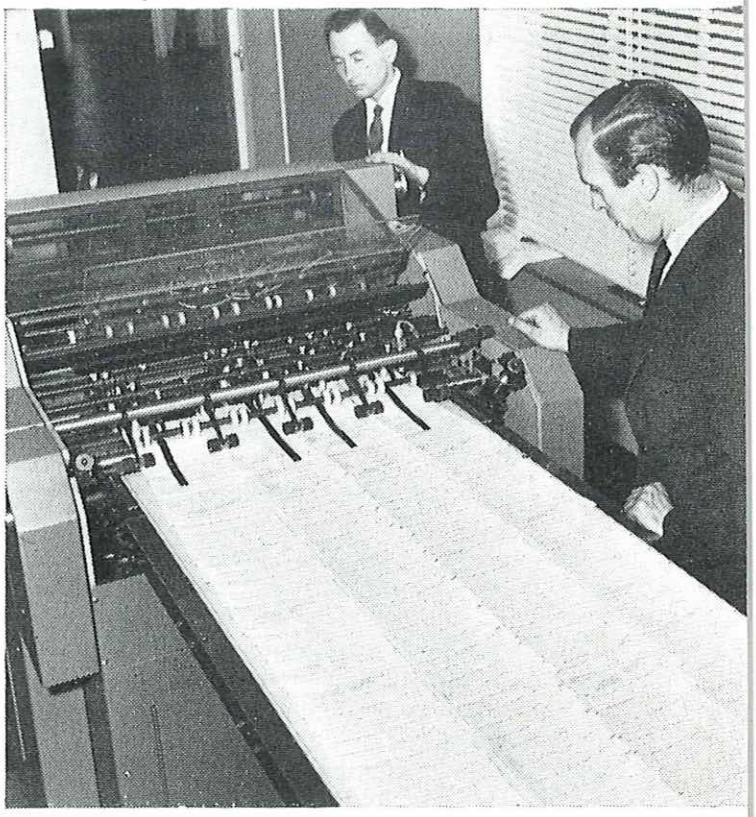
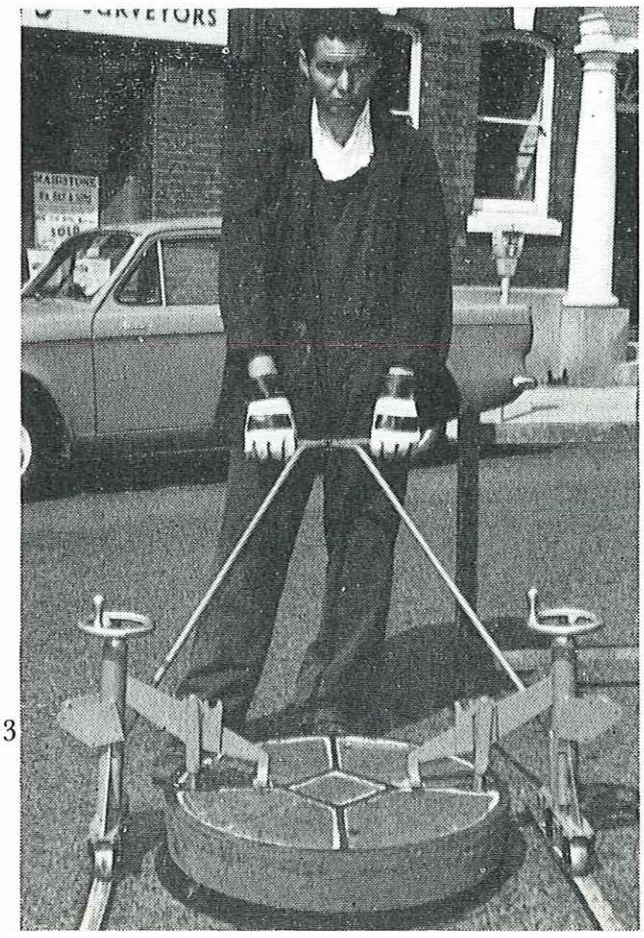


Above: Telephone bills are examined on an automatic guillotine, part of new equipment which will speed the production of accounts. Below: A new device for removing manhole covers and joint boxes, introduced as part of a drive to reduce accidents.



transmission systems with applications in the local, junction and trunk networks. The wide use of digital methods is seen as leading to a merging of communication and computer techniques.

The Unit is taking particular interest in data communication facilities, both in the short-term exploitation of existing networks and the long-term inter-dependence with general-purpose digital communications systems.

RESEARCH AND DEVELOPMENT

Human factors research has been intensified in the light of the need to develop new equipments and to modify existing ones—for example, abbreviated dialling, closed-circuit television for schools and high-speed data transmission to computers.

Main developments in the inland trunk communications transmission field are aimed at making more bandwidth available to cope with growth.

A one-mile experimental millimetric wave length waveguide is being built at the new Post Office Research Station at Martlesham Heath, near Ipswich. In local line distribution, further studies are being carried out into subscribers' carrier systems to achieve economy in the use of line plant.

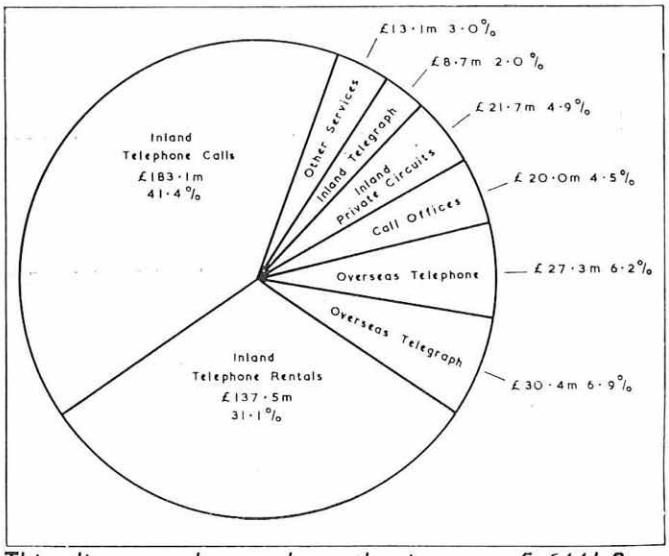
Proposals for a wideband network for television distribution and other relay services, including a pilot scheme in a new town, are being studied.

Research and experimental work is also being carried out on Pulse Code Modulation digital switching at tandem telephone exchanges. Success in this field could pave the way for a nationwide integrated PCM transmission and switching system able to handle telephony, data and facsimile signals and television.

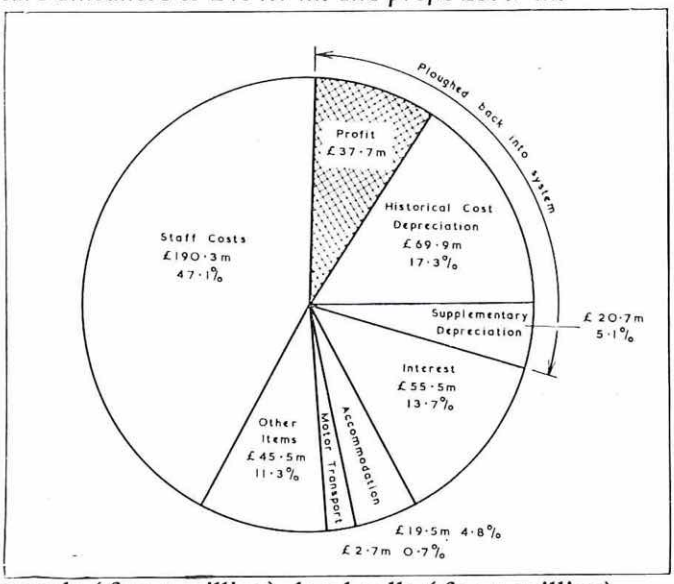
FINANCE

The profit was £37.7 million—£1.6 million less than in 1965-66. Return on capital was 7.7 per cent compared with 8.2 per cent the previous year. Income at £441.8 million was a record and £37.8 million higher than in 1965-66. This was due to increased business expansion which yielded an extra £48.8 million, partly offset by reduced charges of £10.8 million due to the continued expansion of STD. Expenditure increased by £39.4 million to £404.1 million due to higher prices for goods and services, the cost of meeting business expansion, pay awards and so on.

Main profits came from trunk telephone calls (£54.4 million). There were losses on telephone



This diagram shows where the income of £441.8 million came from in 1966-67. Below: Expenditure amounted to £404.1 m. and profit £37.7 m.



rentals (£13.4 million), local calls (£14.7 million), call offices (£4.5 million) and telegrams (£2.6 million).

FUTURE OUTLOOK

The main problems are congestion in the trunk service and waiting lists because of the shortage of equipment at exchanges. But greatly increased supplies of plant have been promised by the manufacturers during the next two years which should help to overcome these weaknesses. In the meantime, the main objective will be to improve still further the quality of service for existing customers.

Blueprint for the future

★*Over the next five years the Post Office plans to invest close on £2,000 million on expanding and improving its telecommunications services. This is nearly double the investment of the past five years.*

★*By 1972 the size of the telecommunications system will grow by 50 per cent, with no increase in manpower.*

★*New services and facilities will be provided and new technologies introduced.*

★*Profitable services will be stimulated and customers will be given a much greater degree of choice of services.*

THESE are the highlights of the blueprint for the future which was outlined by the Postmaster General, Mr. Edward Short, when he recently presented the Post Office Report and Accounts for 1966-67 and at the same time announced that the Post Office had asked the National Board for Prices and Incomes for its views on proposals to make changes in the tariff structure.

"Adequate, efficient communications are vital to industrial efficiency and very important to the life of the community," said Mr. Short. "They are a vital part of the infrastructure of modern society. At present there are too many weaknesses in the services. A lot more modernisation is required. Many more new facilities like data transmission are needed and a great growth potential has to be satisfied."

Mr. Short emphasised that the Post Office is a vast and complex trading enterprise—one of the biggest "firms" in the world—which is subject to all the problems and challenges facing all businesses in Britain today. It aims to give the best possible service at the lowest possible prices consistent with the fair treatment of the staff and sound financial policies. But it cannot do its job of serving the community without the required resources and finance is the key.

On the face of things, the telecommunications services are doing well. Last year they made a profit of nearly £38 million and the return on capital was 7.7 per cent.

But capital expenditure is increasing rapidly and will nearly double in the next five years. The proportion of capital expenditure provided by the Post Office is declining and the amount we have to borrow from the Exchequer and pay interest on is rapidly rising. In 1964, for example, the Post

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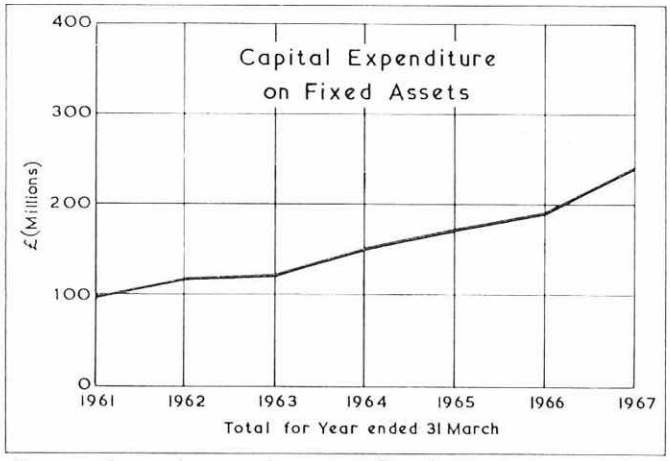
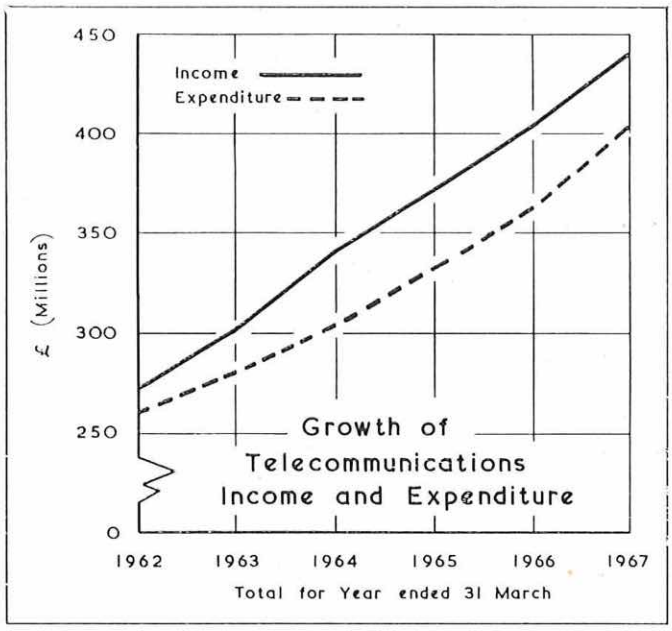


Above: Capital expenditure on fixed assets has more than doubled in the past seven years. Below: This graph shows how both income and expenditure on telecommunications have grown.



Office contributed two-thirds of its capital expenditure from its own resources (profit and money set aside for depreciation).

This year more than half of a much larger expenditure is being borrowed and next year the amount we have to borrow for an even bigger programme will be nearly two-thirds. At present we are paying something like £60 million a year in interest charges on borrowed money. If the present trend continues the proportion of capital the Post Office provides out of its own income will fall still further behind and throw additional burdens on the Exchequer and add to the bill we have to pay in interest charges.

In the present national economic situation the country cannot afford to finance a very large part of the £2,000 million programme out of taxation and at the expense of other urgent needs such as schools, hospitals and roads.

This means that charges for telecommunications services must in future bear a correct relationship to costs and this is the reason why the Prices and Incomes Board has been asked for its views on re-structuring tariffs.

Looking to the future, the Postmaster General said that we hoped to increase the scope for consumer choice—for example, by giving the customer as far as possible the choice between having his own exclusive telephone or shared service according to the rental he was prepared to pay.

The Prices and Incomes Board is being asked to look at this possibility and also to consider the serious distortions in the existing tariff structure which is hindering the balanced development of the system as a whole and the efficient use of plant and other resources. We are, for example, making a very big profit on trunk calls but considerable losses on local calls, rentals and call offices.

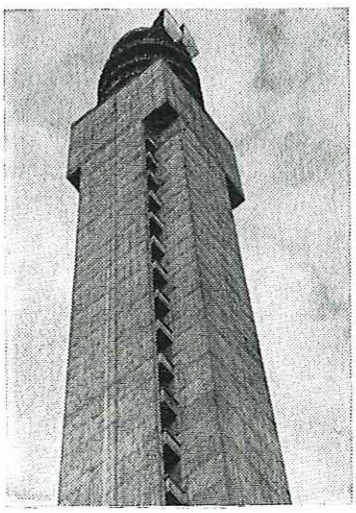
The Postmaster General pointed out that basic charges for telecommunications services have remained unchanged over the past four years during which time annual investment had risen by some 60 per cent to £242 million, wage increases of about £95 million had been absorbed by increased productivity and some £70 million had been given back to customers as benefits from Subscriber Trunk Dialling. During that time, too, manpower productivity had increased by about 40 per cent—a really remarkable achievement.

★ ★ ★

"A MAGNIFICENT MILESTONE"

THE 498 ft. high Birmingham Radio Tower, a vital link in the microwave radio network which the Post Office is building up throughout the country to meet the nation's telephone and television requirements for many years to come, was officially opened at the beginning of October by the Postmaster General, Mr. Edward Short.

The Tower, which has cost some £800,000 to build and equip, will serve both as an important link between the north and the south of the British Isles and as the focal point of the network for the Midlands. Initially, it will cater for about 8,000 simultaneous telephone conversations and 13 television circuits. Ultimately, it will be able to provide capacity for more than 100,000 telephone circuits and at least 40 television circuits. It weighs 6,000 tons and has been built to the most exacting requirements. The Tower is so rigid that even in the strongest winds the upper section containing the aerials tilts by no more than one-third of a degree.



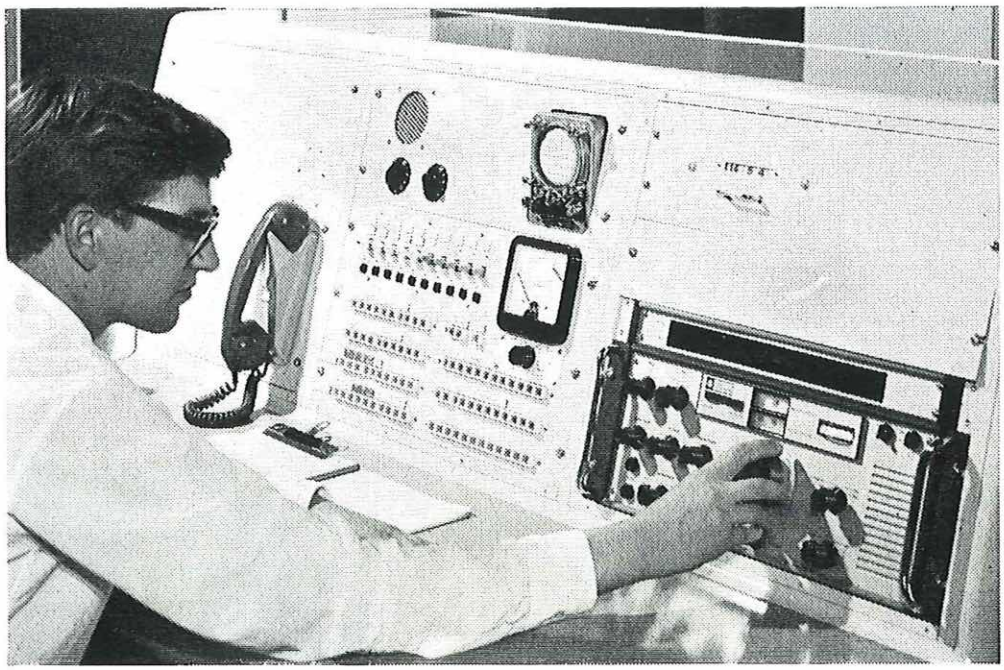
Worm's eyeview of the new Birmingham Tower, 498 ft high and weighing 6,000 tons.

Courtesy: Birmingham Evening Mail

The Postmaster General described the Birmingham Tower as "a magnificent milestone on the road to the communications service of the future .... In the larger context it is also a link in a communication system that embraces the world."

The new Post Office radio receiving station at Bearley plays a big part in world communications. And it can be operated by only two men

THE NEW BEARLEY RADIO LEADS THE WORLD



The Duty Officer's console. An engineer tunes the PR 1,550 HF receiver which incorporates a digital counter to indicate the tuned frequency.

PROBABLY the most technically advanced of its kind in the world, the new Post Office high frequency receiving station at Bearley, near Stratford-upon-Avon, is now in service.

The new Bearley station emphasises that high frequency (h.f.) radio communication is by no means a dying technique. It is adapting itself to play a very important part alongside submarine telephone cable and satellite systems in the world communications network of the future.

Costing some £500,000 to build and equip, the new radio station replaces the original station which has been in use since 1953.

It is designed and built with an eye to the future and with the object of combining efficient reception of radio-telephone and radio-telegraph transmissions with greatly improved productivity.

This latter objective has been met by installing a Central Control Position (CCP) which enables some 60 receivers (100 if necessary) to be re-tuned automatically according to the changing ionospheric propagation conditions. It also provides a continuous record of conditions on each radio route in use and by this means the need for a change of frequency at a distant transmitter can be anticipated and prompt action can be taken to

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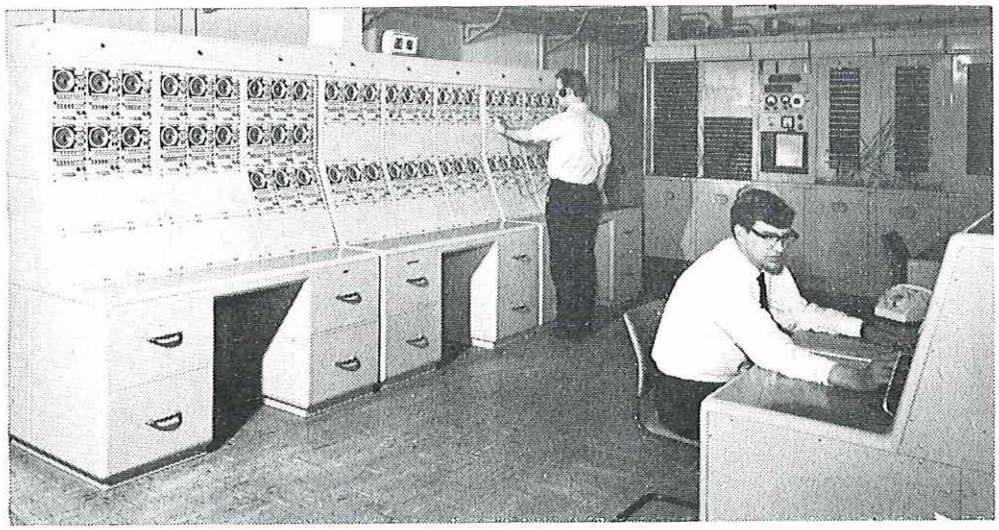


Thirty-six PVR 800 automatically tuned receivers are operated from this central control position (left). The Duty Officer's console is on the right.

arrange such a change, thus minimising interruption of traffic over the route. Two men at the CCP can normally handle these operations for the whole station. Many more would be required to operate manually-tuned receivers.

CCP operation has been made possible partly by the provision of automatically tuned receivers (previously unknown in this type of equipment) and partly by stabilisation, with a high degree of precision, of the frequencies used in them to convert radio-frequency (r.f.) signals to audio frequency.

To achieve this, frequency synthesisers are used which reflect the accuracy of a master frequency 100 kHz source comprising a system of three crystal oscillators in 30 ft. deep bore-holes where temperature remains substantially constant year-in year-out, without artificial control. The 100 kHz accuracy can be maintained with adjustments to the oscillators about twice a year to within 5 in 10^8 which is likely to meet the most exacting future requirements.

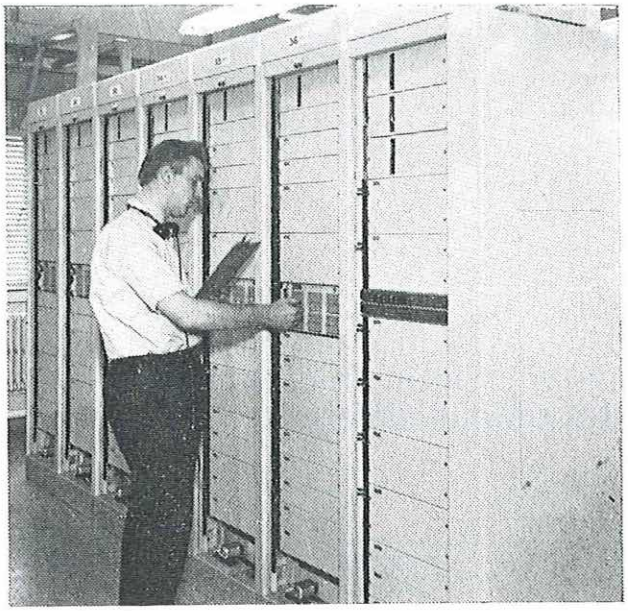
Another novel feature of the new station is the 36 independent sideband (isb) transistor receivers (type PVR 800) for telephone or multichannel telegraph services which were designed and supplied to a Post Office performance specification by the Plessey Co.

The PVR 800 is a quadruple superheterodyne receiver in which conventional r.f. tuning has been dispensed with in favour of six band-pass filters covering the frequency range 3 to 27.5 MHz in logarithmic steps. This eliminates tuning capacitors from the r.f. section and is typical of the approach for reducing mechanical components to the minimum, thus enhancing reliability. The appropriate filter is selected as a function of the automatic tuning process and overloading of the subsequent wideband r.f. amplifying stages is prevented by an attenuator which is automatically controlled by the aggregate strength of all signals passing through the filter.

Tuning is accomplished from the CCP by activating one of six pre-set memory units, each adjustable in steps of 125 Hz over the 3-27.5 MHz range which, in conjunction with a logic unit, controls the frequency synthesiser and other necessary tuning functions. The receiver then searches automatically over the very small band of frequencies necessary to cover the permissible inaccuracy of the distant transmitter's frequency. If the wanted signal is present with sufficient field strength for traffic, the receiver locks on to it and indicates this condition to CCP. In addition to the PVR 800s, 20 Marconi frequency-shift telegraph receivers (modified by the Post Office to give similar remote control facilities) are available for service on routes requiring only a small number of telegraph channels.

The new Bearley station which, technically, could be remotely controlled from London or elsewhere, is a great advance on the old station provided originally to meet the growing demand for overseas telephone and telegraph communication following World War Two.

Then, with transoceanic submarine telephone cables still under development and communication satellites only a future possibility, h.f. radio provided the only medium for meeting the demand



A suite of PVR 800 independent sideband repeaters. These all-transistor receivers combine efficiency and reliable reception for long-distance radio-telephone and radio-telegraph transmissions with maximum economy.

quickly. For this reason some temporary buildings on the Bearley site (formerly an airfield of some 700 acres) were converted to house the radio equipment and the operating staff with the aim of providing services in the shortest possible time.

Since 1953, the old Bearley station has carried a substantial proportion of the long-distance radio-telephone and radio-telegraph services operated by the Post Office, mainly from India, the Middle East and Africa. It has kept pace with the advances in h.f. technology, largely for telegraphy, which have so radically improved reliability and traffic-carrying capacity, particularly i.s.b. multi-channel telegraph systems with error-correcting techniques (ARQ) which have revolutionised h.f. radio telegraphy.

Bearley radio station currently carries, among other services, the largest radio system from Pretoria (18-two channel ARQ systems) and a leased composite system for NASA via Las Palmas. This link was specially set up in 1960 for the operation of the US space programme and forms a very important part of a world-wide communications network.

Despite the enormous traffic carrying potential of submarine telephone cables and multi-access communication satellites, h.f. radio has an important part to play in the world communication network of the future and the demand for h.f. radio equipment is higher today than ever before.

For lightly-loaded routes in particular, and there are very many of these, it is appreciably cheaper than cable or satellite systems. With ARQ for telegraphy and the new Post Office Lincompex system* for telephony, h.f. radio can also compete favourably with the newer media in quality and reliability.

* *See Telecommunications Journal, Summer* 1965.

A NEW EXCHANGE FOR BARROW

The new three-storey auto-manual exchange now being built at Barrow-in-Furness at a cost of £150,000 will incorporate directional radio aerials to send trunk calls south across Morecambe Bay. This new radio link will supplement the existing submarine cable which has hitherto been used for carrying trunk calls across the Bay.

The new exchange will also be one of the first of the new exchanges in the North-West Region to have the new desk-type cordless switchboard. Barrow is a group centre serving 13 small automatic exchanges. When the new exchange becomes operational—it is hoped by 1970—almost all subscribers in the Furness area will have Subscriber Trunk Dialling.

A special series of three-day advanced training courses for hotel switchboard operators who already have a basic knowledge of private switchboard operating, was recently introduced by London Telecommunications Region. Each course will include discussions, film shows and visits to a local exchange.

LTR will continue to provide similar courses for business firms' operators which were introduced in 1966 and recently extended to Manchester.

★

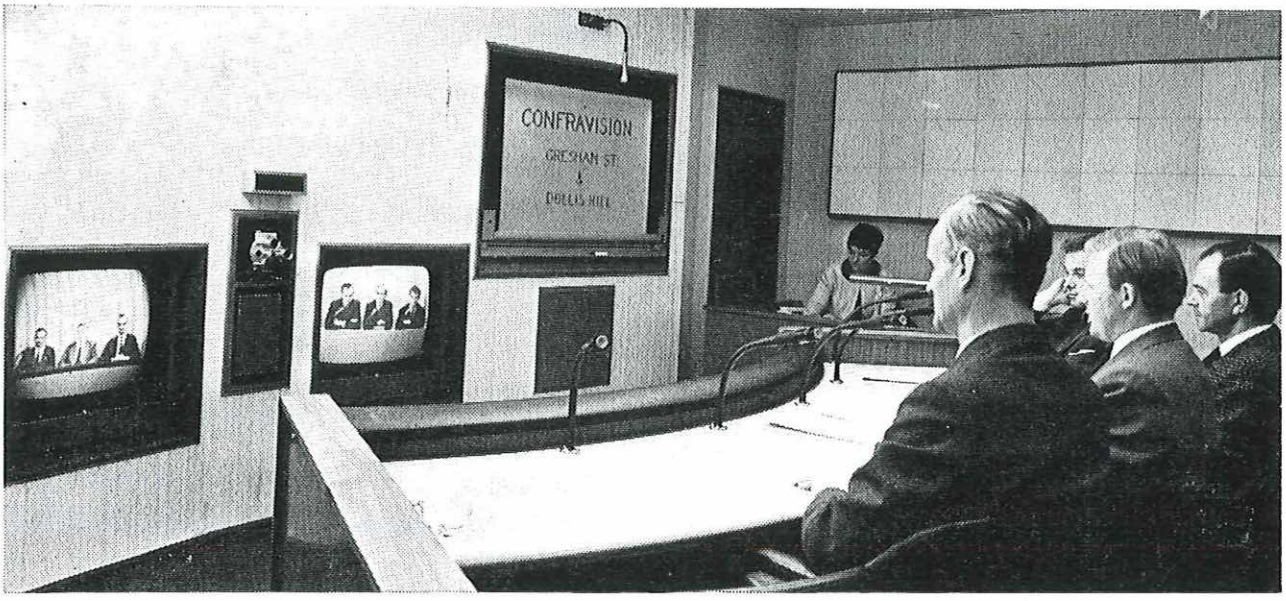
Mr. C. J. Gill, Director of the External Telecommunications Executive, has been appointed a director of Cable and Wireless Ltd.

Mr. Gill, who joined the Post Office at Nottingham in 1926, was appointed Vice-Director of ETE in 1964, with special responsibilities for satellite communications, and Director in September 1967.

CONFRAVISION—
the new aid for business communication

By T. K. LORD
and R. G. JONES

The Post Office recently demonstrated a new closed-circuit television system which offers attractive facilities to business and industry. It is a special conference service with many far-reaching possibilities



A Confravision session in progress between engineers at Gresham Street and, at the distant end, engineers at the Post Office Research Station at Dollis Hill, just over ten miles away.

TRIALS are being carried out by the Post Office with a new type of closed-circuit television system which enables two groups of people in widely separated places to be brought together as if they were at one conference table.

The new system—known as Confravision—is operating between the Post Office Engineering Department's headquarters at Gresham Street, in Central London and the Research Station at Dollis Hill, about ten miles away. A special studio has been set up at each place and linked by vision and sound channels so as to allow transmission in both directions simultaneously. The two studios are inter-connected by way of the London Television Network Switching Centre in the Post Office Tower.

The Confravision system is thought to have far-reaching possibilities and prove of great value to busy business executives, engineers and scientists. If similar studios were provided in major cities and each was connected to its local television network switching centre, inter-city vision and sound channels could be used to place

Miss P. Bradshaw poses at the Confravision demonstration while controlling the studio facilities with a miniature switchboard.

any two studios in contact. Instead of travelling long distances to attend meetings and possibly having to stay overnight groups of people could simply go to the nearest Confravision studio. There, in only a few hours, they could complete their business which would otherwise have taken a day or more.

At this stage it is thought that the most efficient use of Confravision would be made if the Post Office provided the studios and made them available to customers on, say, an hourly rental basis. On the other hand, organisations which could make full exclusive use of the system could have their own studios, the vision and sound channels being hired from and switched by the Post Office.

When the studios now being used in the experiment were planned a number of objectives were laid down. The Gresham Street accommodation was to be of executive standard to serve as a prototype for future studios while the Dollis Hill studio was to be more simple. It was also decided that the system should be capable of operation without an engineer in attendance to avoid the extra cost this would involve and because some conferences might be confidential. Most Confravision users are unlikely to be familiar with studio techniques and the accommodation was therefore arranged on this assumption. In addition, the number of operating controls was kept to a minimum. Finally, the studio lighting had to avoid subjecting participants to eye strain.

To bring a studio into use, a single key-switch activates the sound and vision equipment and switches on the lighting. Control of the sound and vision facilities is concentrated into a small, five-key control box which can be positioned on the conference table or alternatively, as at Gresham Street, on the secretary's table.

A single camera is positioned to view the conference table. By rotating the lens turret, the camera may be set to include one, three or five people so that the maximum use of the picture monitor screen is made according to the number of chairs occupied. Five people are considered to be the maximum that would give an adequate size of individual images.

At Dollis Hill, a conventional wall-mounted blackboard is provided, viewed from the front by a second camera. The person using the blackboard has to stand aside at times to avoid obstructing the camera. At Gresham Street a similar facility is provided by a device consisting of a transparent wall-panel covered with translucent paper drawn from a magazine. A camera views the reverse side of the translucent paper so that an unobstructed view of the information being written can be obtained.

Two picture monitors are provided in each studio. One shows the view of the local conference table, or blackboard, and the other the view of the distant conference table, or blackboard.

Individual microphones are mounted on the conference tables and above the blackboards. Sound reception is from a single loudspeaker mounted between the picture monitors. Acoustic treatment of the studios and pre-set signal levels

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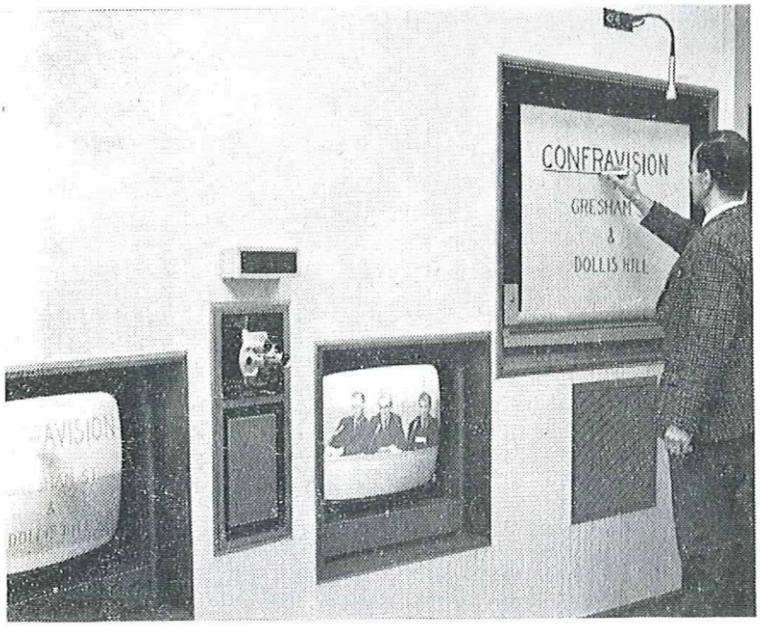


Left: The wall-mounted blackboard, covered with translucent paper, enables written information, diagrams and so on to be exchanged.

allow complete freedom of conversation without the need to switch the direction of transmission.

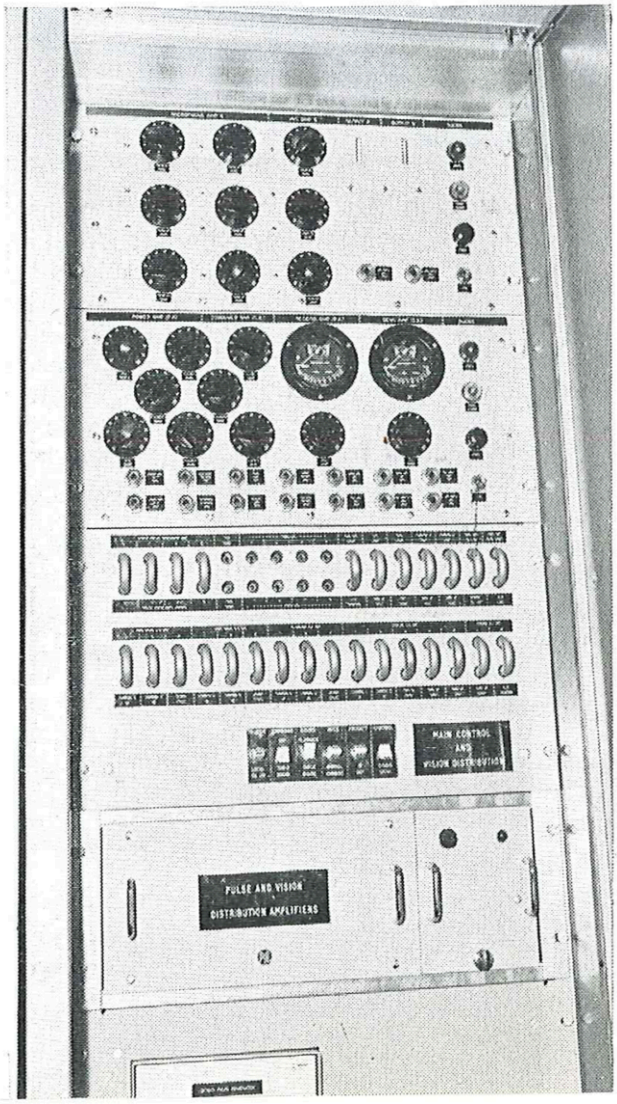
The sound is of broadcast quality and provision is made for secrecy of sound transmission which does not detract from this quality. A tape-recorder is also available and can be used either to record the whole proceedings or to inject a recording into the system for both studios to hear.

During many conferences documents need to be distributed at the table. For Confravision a fascimile installation permits a document, up to foolscap size, to be transmitted to the other studio. A photo-copier in each studio is then used to provide individual copies of the original. The facsimile is operated either over a private wire or over the public network. The latter method has the advantage that any compatible installation on a customer's premises can be used to exchange information with the Confravision studio. The whole process occupies only a few minutes.

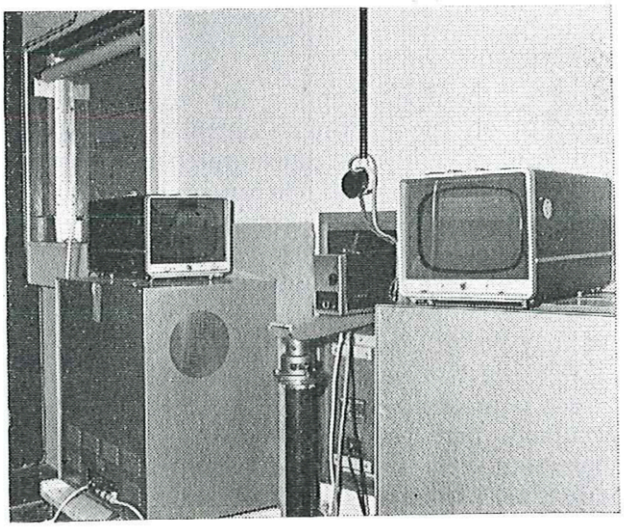
The working conditions in the studios are superior to those in most conference rooms. After becoming accustomed to the experience of appearing on television, Confravision participants find that discussions can be held as readily as in a conventional conference setting.

The use of the Confravision studios in Britain may not in future be restricted to the General

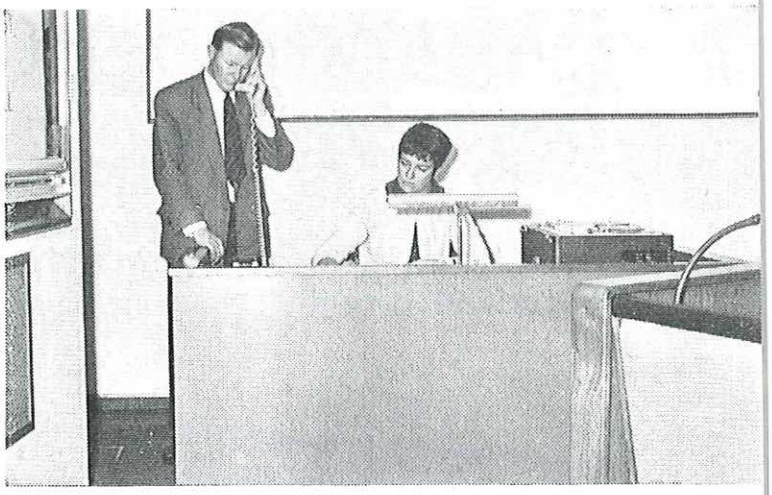
Below: A front view of the studio equipment cabinet. Sound, vision and lighting circuits are controlled from this cabinet by way of the control box in the studio



Below: The equipment room at Gresham Street showing a rear view of the picture monitors, camera and loudspeaker. The small picture monitors are maintenance aids.



The Secretary's desk from where the studio facilities are controlled. A nearby door leads to the facsimile and photo-copying room.



Post Office network. Access to the rest of Europe via Eurovision channels and to other Continents by way of satellites, would seem possible. Compatible line standards would, of course, have to be arranged.

Apart from Confravision, the studios have other uses. Having access to the London Television Network Switching Centre either Gresham Street or Dollis Hill may be used as a lecture room for a one-way vision relay, or a sound-only relay, to a number of reception points. Arrangements could also be made for a television lecture to be recorded on tape for transmission at a later date or on a number of occasions. A further use is the preparation of tape-recordings of speech only, or for the demonstration of such recordings. And for this the studio is self-contained.

A number of business organisations have expressed interest in Confravision and it is hoped that they, and members of the Post Office and other Government Departments, will take advantage of the trial scheme to experience this conference medium of today and tomorrow. Enquiries relating to the use of Confravision should be made to the Inland Telecommunications Department, Marketing Branch (Forecast and Market Research Division) Post Office Headquarters, London.

●

"A great boon"

"THIS new system could prove to be a very great boon to commerce and industry," said Mr. A. B. Harnden, the Senior Director, Telecommunications, when he recently opened the Confravision Studio at the Post Office Engineering Department's Headquarters in Gresham Street, London.

He emphasised, however, that the system had been developed so far only to a prototype stage and that at present the project was a market research exercise to estimate the likely demand before it was decided whether to go ahead and set up an operational network. Questionnaires had been issued to many business and industrial firms whose representatives at the top management level had been invited to see for themselves how the service worked between Gresham Street and the Research Station at Dollis Hill.

The cost of the service would not be known until the market research had been completed. But a provisional estimate was about £120 for an hour between studios up to 100 miles apart to £200 an hour at 200 miles.

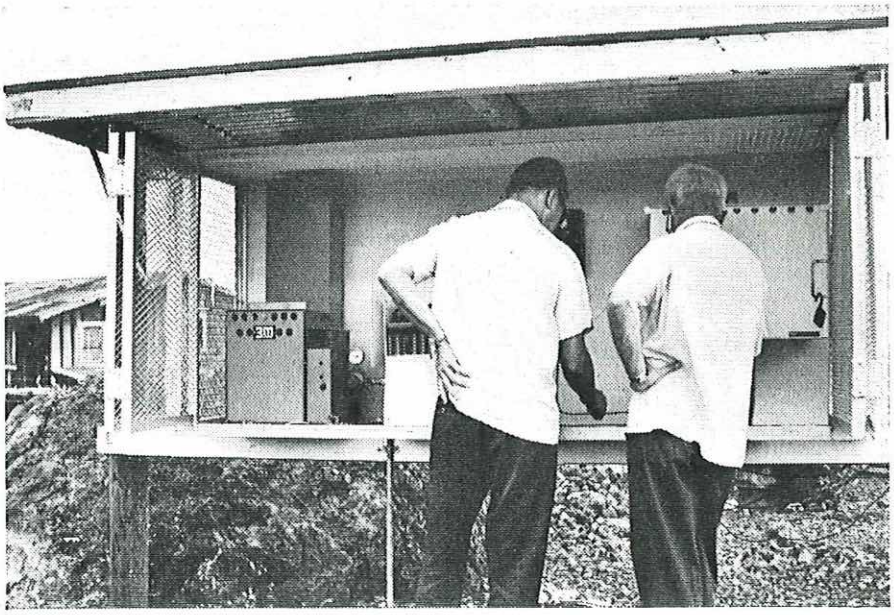
If the response was favourable, the Post Office would hope to establish a Confravision Service early in the 1970s. Studios would be set up in the principal cities, such as London, Birmingham, Bristol, Edinburgh, Glasgow, Liverpool, Manchester and Southampton where companies would be able to book times for their Confravision meetings. The cost of providing a studio would be about between £5,000 to £10,000.

Confravision meetings would be confidential and a scrambling device could be fitted to ensure secrecy.

Transmission of a Confravision call would require a frequency bandwidth which, if used for ordinary telephony, would carry more than 1,000 telephone conversations. Such a call would need the transmission of two pictures, and two transmission channels, each of about five-and-a-half MHz bandwidth, would connect the studios. A future Confravision service would probably be based on the use of broadband frequency channels in a directional radio microwave transmission system.

PROPANE POWER FOR CARRIER SYSTEMS

A new type of generator, powered by propane gas, is being tried out in Scotland. It could have exciting possibilities for the future



The 3M generators are already in use in the remote areas of Hawaii where no commercial power is available. This unit (left) is shown in its protective container.

A FIELD trial is being carried out in northern Scotland with a new device which can provide power for telephones in remote areas where no mains electricity supply exists or during emergencies when the mains supply fails.

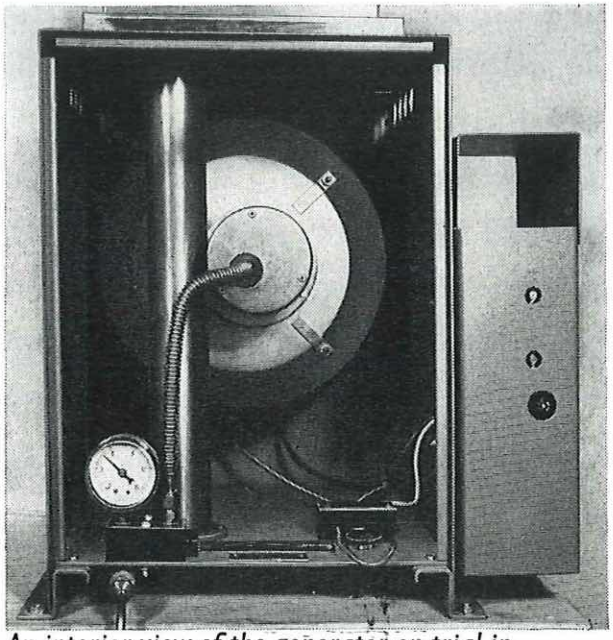
The new apparatus is a thermo-electric generator, powered by propane gas, which produces enough electrical energy to operate carrier systems and enable many conversations to be carried out simultaneously over a single pair of wires.

The new generator—known as the 3M—requires very little maintenance. Equipped with propane gas tanks holding up to 250 gallons, it can operate continuously for as long as six months without attention.

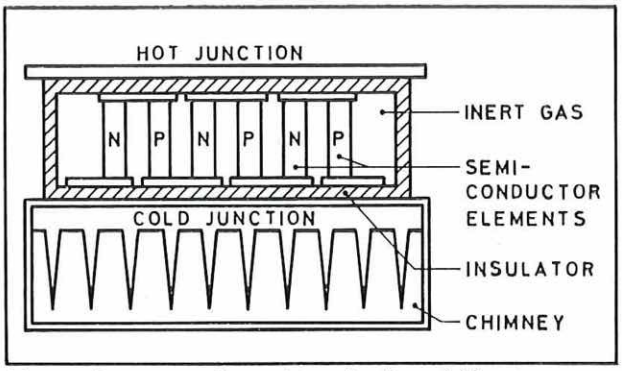
The thermo-electric generator dates back to 1822 when the German physicist Seebeck discovered that if a loop was made of two different metals and one junction was heated, an electric current flows in the loop. The voltage produced is proportional to the temperature differences of the junctions. However, the electrical energy generated in relation to the heat required was too small for any practical application except for the electric pyrometer—an instrument for measuring high temperatures.

The introduction of semi-conductors, which was triggered off by the invention of the transistor, led to the use of semi-conductors in the thermo-electric generator field, increasing their efficiency to the point at which they now compare favourably with primary battery cells in cost and offer maintenance advantages.

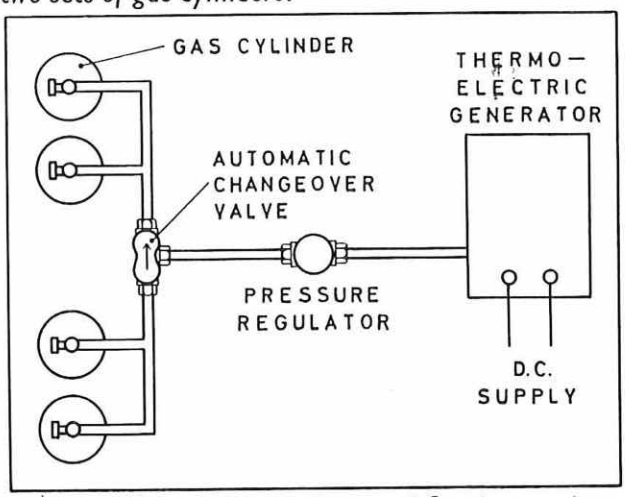
The thermo-electric generator junctions are made of "P"-type and "N"-type semi-conductors, so arranged that alternate junctions in the circuit are hot and cold. The voltage produced is in



An interior view of the generator on trial in Scotland. It requires very little maintenance.



Above: Diagram shows how the P and N-type junctions are arranged so that alternate junctions in the circuit are hot and cold. Below: The propane gas installation incorporates automatic change-over arrangements between two sets of gas cylinders.



proportion to the number of junctions in the circuit for a given temperature difference and a number of circuits are connected in parallel to increase the power output. Typically, an assembly will produce six, 12 or 24 volts at powers up to 200 watts.

The hot junctions are heated by the propane gas flame and the cold junctions are cooled by fins projecting into a chimney which increases the air flow across the fins. The semi-conductors are sealed in a chamber of inert gas to prevent deterioration.

To obtain maximum economy, the thermo-electric generator must be closely matched to the load since the amount of heat it consumes is virtually independent of the electric energy being taken. A direct-current-to-direct-current converter is often needed to provide a stabilised supply at the required voltage and this reduces the output by about 20 per cent.

While propane gas is a very convenient source of heat for these generators, radio-active isotopes, which are becoming cheaper, may in the future provide an economic alternative. Thermo-electric generators fitted with isotopes as sources of heat could provide continuous electric power to operate a telephone system for up to ten years without requiring attention.

The new thermo-electric generators are also being used as power sources for navigational aids, in automatic weather stations and for the monitoring of water levels.

The trial now being carried out in Scotland is confined to the use of 3M for powering carrier systems. If the trial is successful the Post Office may find a number of other uses for thermo-electric generators.

★

In the six months up to the end of September, 1967, the Post Office met 552,000 orders for telephone service. About 56 per cent of the orders for exchange connections are now being completed within a fortnight.

★

The number of telephone exchange connections in use throughout the country at the end of September was 7,121,332. There were then 11,693,504 telephones compared with 11,075,183 at the end of September, 1966.

NOW DATA CALLS ARE ANSWERED AUTOMATICALLY

Automatic answering facilities for use with Post Office Datel Services have been introduced so that data calls can be made over the telephone network in Britain without the need for human intervention at the called data stations. Plans are being made for similar facilities to become available for international Datel services

By E. G. COLLIER

An operator feeds punched tape into the tape reader of a modern data terminal equipment for use with Datel 600 automatic answering facilities. The left-hand cabinet houses the controls, error-correcting and control circuitry.

THE Post Office Datel Services cater for a wide variety of data transmission requirements over both the public telephone network and private wires.

Datel 200, Datel 300 and Datel 600 may be used over the public network. The Datel 200 provides bothway transmission at 200 binary digits (bits) a second. Datel 300 caters for transmission of data at 20 characters a second from punched cards, punched tape or keyboard from outstations to a central collecting point. The Datel 600 has facilities for transmitting at 600 or 1,200 bits a second in one direction at a time, combined if necessary with transmission of signals in the opposite direction at a speed of up to 75 bits a second for error control or other purposes.

Ideally, data terminal equipment should be able, for some applications, to establish calls, transmit and receive data and then clear, entirely without operator attention. Originally, all the Datel Services had to be manually operated. Now, however, automatic answering facilities have been introduced for the Datel 200, 300, and 600 Services and arrangements for calls to be set up automatically are being developed.

When an incoming call is received at an automatic data station, a relay associated with the

OVER

Rack-mounted Datel 200 modems being used with automatic answering facilities at a multi-access computer installation.

modem is operated by the ringing signals. This alerts the terminal equipment by means of a "Calling Indicator" lead. If the terminal equipment is able to accept the call it causes the modem to be connected to the line to answer the call within two seconds. The modem at the calling station is manually connected and the terminal equipment then automatically carries out the necessary synchronising and identification procedures after which the data can be transmitted in one or both directions.

A tape-handling data terminal can be arranged to transmit tape in either direction under the control of a calling operator but without the need for an operator to be present at the called terminal. When transmission is complete, a signal from the calling station causes the answering station to clear automatically.

In some data systems which use automatic answering facilities it may be helpful to have a short recorded voice announcement to state the identity of the answering station or to pass a brief message before the modem at that station is connected to the line. For this purpose, telephone answering sets can be fitted, the modems being connected to line automatically after the announcement has been made.

If a subscriber inadvertently telephones a data station which has automatic answering facilities, a recorded announcement or period of tone will make him aware of his error. When an automatic answering data station does not detect the appropriate data conditions from the calling station within a prescribed time (this is not less than 20 seconds from the time the call is received) the call can be automatically cleared at the answering station.

One model of the Datel 600 modem can transmit or receive but it cannot do both simultaneously. When used with automatic answering facilities it is controlled to transmit tone for at least three seconds after answering the incoming call. The modem is then "turned around" to receive so that it can detect whether a data tone is present from the calling station. This transmit-receive sequence continues until the called station detects that a modem has been connected or until a "time-out" period of at least 20 seconds has passed without such detection. In the latter instance, the answering station will clear down automatically.

A customer connected in error to an automatic answering data station of this type receives interrupted tone with on periods longer than three seconds and off periods of less than three-quarters of a second.

Automatic answering of data calls is particularly advantageous when either a large number of out-stations need access to a central station or when central stations need to have data communi-

A Post Office photographic assistant poses with a Datel Modem No. 1 which can cater for automatic answering facilities.

cation with a large number of out-stations which may be unattended.

Conversational mode, multiple-access, time-sharing computers, which enable, say, 50 or more data out-stations with teleprinter-type consoles to operate simultaneously, can provide service with minimum delay when automatic answering facilities are used on incoming exchange lines and private wires. In these systems, the computer can work with a number of different programs at the same time by allocating a few seconds or less to each in turn so that each user appears to have sole control of the computer for his particular task.

The number of modems employed at computer centres such as these make it essential for the modems to be installed as compactly as practicable—preferably without the large array of telephones which would arise if each modem had its own individual instrument. This can be achieved by mounting the modems in racks and by terminating the lines on key and lamp units instead of telephones. The key and lamp units enable the automatic answering activity of the lines to be visually monitored and also provide access to individual lines for testing and manual answering when required.

Automatic data call origination and answering facilities are being closely studied by a special working party of the Consultative Committee on International Telegraphy and Telephony of the International Telecommunications Union. When its recommendations have been finalised and put into effect it will be possible to extend the automatic answering system to international data calls.

At present, some 2,000 computers are in operation in Britain and the number is growing rapidly. In this expanding market, the automatic answering facility has a potentially valuable role to play in enabling calls over the Post Office Datel Services to be established speedily to unattended stations. This simple aid can make a very worthwhile contribution to efficiency and productivity.

THE AUTHOR

Mr. E. G. Collier, is an Assistant Staff Engineer in the Organisation and Efficiency (Maintenance and Computers) Branch of the Engineering Department which he joined in July, 1967, from the Telegraph and Data Systems Branch of the Engineering Department. He joined the Post Office as a Youth-in-Training in the Oxford Telephone Area in 1941.

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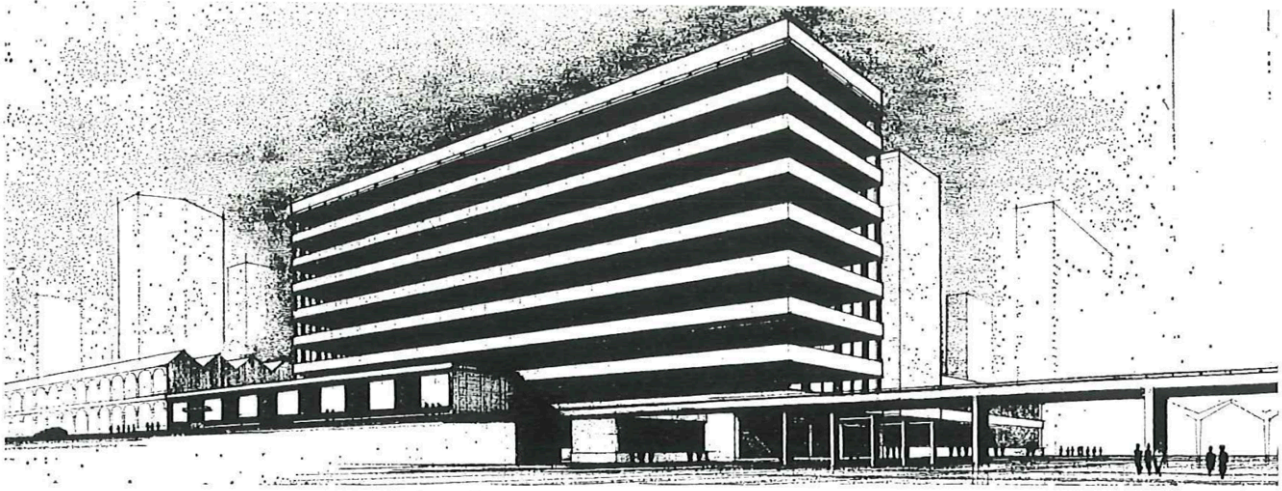
Some 150 engineers and specialists from more than 20 countries attended a CCITT data transmission study group in Geneva recently to discuss, among other matters, the transmission of information over long-distance links between computers and between computers and equipment which interrogates them.



An artist's impression of what the new telecommunications centre in Glasgow will look like.

A new telecoms centre for Glasgow

BY W. G. J. BARNETT

A 12-storey telecommunications centre—to be known as Dial House and costing about £2,000,000 to erect—is under construction at Bishop Street, Glasgow.

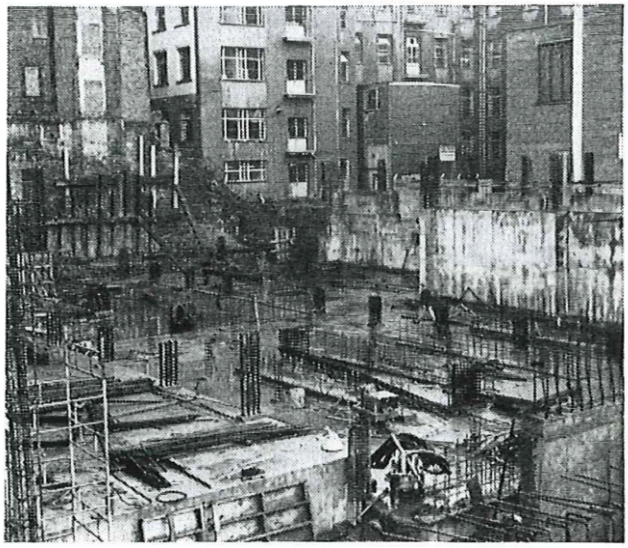
The new centre will be 180 feet high, 266 feet long and 96 feet wide and have a floor area of 260,000 square feet. It is planned to have the building ready for equipment by August, 1969. Most of the equipment to be installed initially has to be in service during the latter half of 1970 if the growing needs of the telecommunications service in this area are to be met.

The building will accommodate a transit switching centre; an incoming and outgoing trunk non-director exchange; a telex exchange; a 100-position trunk control centre; a directory enquiry suite; a repeater station; power plants and power supply equipment, including transformers, switchgear and stand-by power plants. The main stand-by plant will ultimately consist of four-engine alternator sets, each with an output of one megawatt. The power load for the entire building will be six megawatts supplied to the transformers at 11 kilovolts.

To allow for a maximum of 400 cables, a 250-yard long tunnel is being constructed from Bishop Street to Holland Street. The tunnel will terminate at the bottom of a 50 ft. deep vertical shaft which will be used for bringing cables up to surface level. Before work on the tunnel could start, water, gas electricity and sewers had to be diverted. This involved the construction of an alternative concrete sewer 200 yards long and varying in depth from 30 to 50 feet.

A feature of the new building, which will include staff welfare and canteen facilities, will be a fully automatic temperature control and air conditioning system. At the outset the system will supply heat to the building and, when equipment is installed, extract heat if necessary to maintain the apparatus rooms at the correct level.

The new building will form an integral part of Glasgow Corporation's scheme for re-developing the Anderston Area of the city. It will be adjacent to the existing group of buildings comprising the present telecommunications centre which will continue in operation after Dial House is built.



The concrete reinforcing rods rise and Dial House begins to take shape. It will be completed and ready for service by autumn, 1970.

A PIP SCHEME TO STOP SELF-INFLICTED WOUNDS

By A. F. G. ALLAN, C. Eng., MIEE

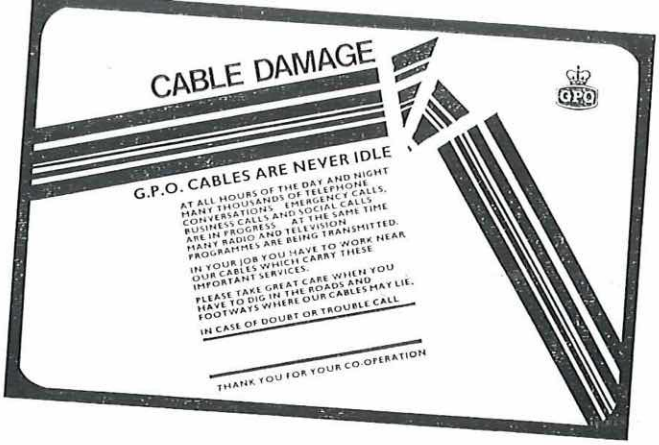
A nationwide publicity drive is being carried out to reduce the number of underground cable failures caused by preventable damage

At a roadside, tailboard discussion in the Aberdeen Telephone Area, an Executive Engineer puts over the Plant Improvement Plan message to his men.

A DETAILED investigation to determine the true basic causes of underground cable failures, particularly those resulting in interruptions to service, indicates that four in every ten of such faults stem, directly or indirectly, from human activity in or near Post Office cable tracks.

While this was not entirely unexpected, it had not been fully appreciated that, in recent years particularly, the operations of Post Office working parties themselves, or of contractors working on behalf of the Post Office, had become a major factor in the field of 'human activity' failures.

A publicity campaign has, therefore, now been launched to emphasise the need for more care in planning and executing works by staff engaged on underground cable operations. It is hoped that a significant reduction in these 'self-inflicted wounds' will be achieved and that present rates of improvement, both in serviceability and productivity, will not only be maintained, but increased.



Ten thousand copies of this card (right), which emphasises the need for care in carrying out work near Post Office cables, are being distributed to other authorities throughout Britain.

Most national telecommunication systems depend on considerable mileages of external cables for connecting subscribers to exchanges, exchanges to repeater (amplifier) stations, exchanges to radio terminals and so on. In Great Britain nearly 85,000 miles of trunk and junction cables are in service, in addition to the extensive local exchange distribution networks. All require to be kept in good working order. Whether buried directly in the ground, carried in ducts or conduits, or supported on poles above ground, these cables are subject to many natural hazards—corrosion, fatigue, vibration, subsidence and so on.

Pressurisation (filling the cables with dry air under pressure—see the Telecommunications Journal Autumn 1966) has gone a long way towards preventing most sheath defects arising from these natural causes from becoming the source of service failures.

Pressurisation is relatively powerless, however, to combat the effects of major damage which is generally the result of human activities of one kind or another. Since the end of World War Two the problem of damage by other authorities—for example, on road improvements and by electricity, gas, water and sewerage undertakings and so on—has always been present and much effort has been expended in devising protection schemes and improving co-operation and co-ordination between the Post Office and the other authorities.

The difficulties associated with roadworks projects and the provision, renewal and rearrangement of main services—for all of which there are statutory obligations to advise all other interested parties of the work to be carried out—were described in the Winter, 1961 issue. In addition there are numerous small works, many only too likely to disturb or damage Post Office underground plant, for which preliminary advice is not called for.

All the efforts made so far to prevent damage and protect service are still not sufficiently effective. This is only too evident from the continuing and persistent rise in the number of instances of damage caused by other authorities and a fairly constant ratio of one in every two incidents resulting in service interruption.

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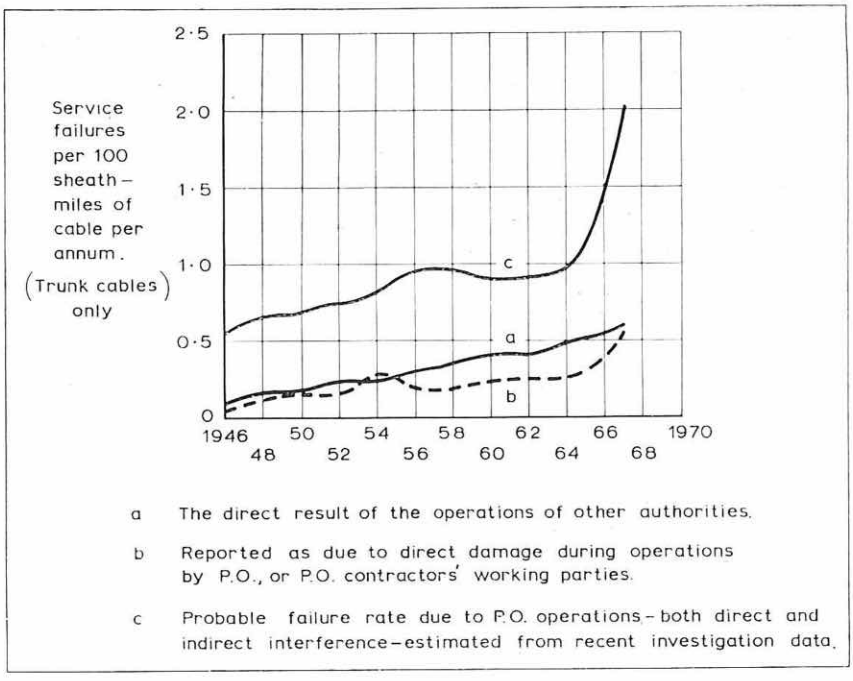
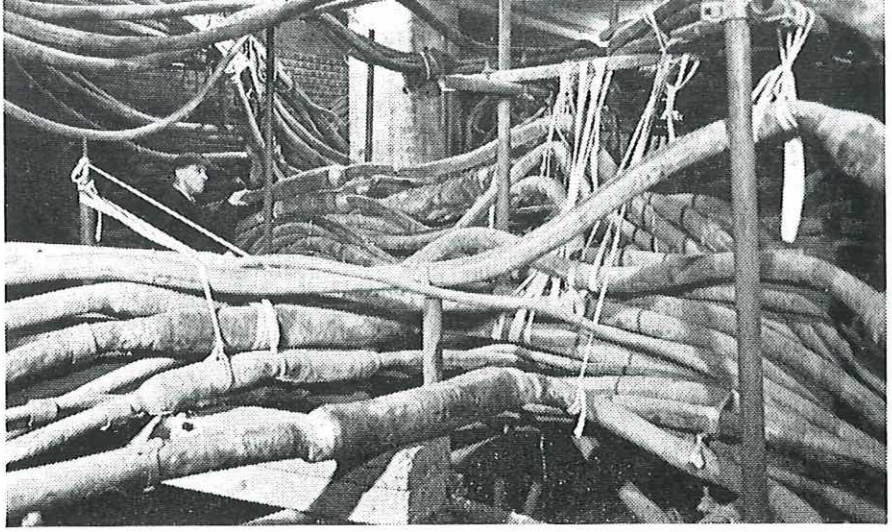


This diagram shows how the number of cases of damage to Post Office underground trunk cables has risen since 1946.

FIG 1.



Many cable chambers are being reconstructed as part of the cabling programme to meet expansion. This is the cable chamber below the Holborn Exchange, London. All the entry cables shown here need to be kept in fault-free condition.

The marked rise in recent years in damage by Post Office working parties or contractors working on behalf of the Post Office, is not, of course, due to any sudden deterioration in the quality of either Post Office or contractors' staff nor to any sudden change in materials or methods. It is primarily the result of the Post Office's determination to improve significantly the general condition of the existing cable network and simultaneously to step up the installation rate of new and additional cables to meet the unprecedented demand for circuits—for example, doubling in about five years the number of trunk circuits which have been built up over the past 50 years. Both these aims require a very large amount of physical work to be carried out on existing cable routes and considerable disturbance to the working cables.

The cable pressurisation programme, although in itself a protective measure, has demanded considerable movement of cables over the past four to five years, so that pressure-test valves can be fitted to cable joints and for detecting and repairing the hundreds of small holes and cracks in cable sheaths which had accumulated over many years. The work associated with this programme has inevitably produced its own crop of troubles but, with this major task now substantially completed, some reduction in failure incidents from this source will soon become apparent.

The cabling programme to meet expansion requirements continues, however, and this is making necessary the laying of many miles of additional duct-tract, the demolition and rebuilding of hundreds of congested jointing chambers and much interference with the existing cable networks.

Both the pressurisation and cable expansion programmes have, so far, been virtually time-coincident and although there has been, in consequence, a very heavy demand on manpower resources, neither programme has been allowed to suffer at the expense of the other. In spite of all the activities and the probably inevitable mishaps and accidents, the value of the rapid spread of pressurisation is evident in the achievement in the 1966/67 year, of the lowest overall service-failure rates on trunk and junction routes, for some 20 years.

But the full benefits of pressurisation will not be obtained unless there is first a check and, subsequently, a reversal of the trend in damage incidents associated with the continuing cable expansion programme. A downward trend in damage incidents would yield other benefits of which the most important would be the release of staff now engaged on repairs, for more productive work.

It is to this end that the publicity campaign—known as Plant Improvement Plan No. 2—has now been launched, drawing the attention of all staff involved in planning or executing underground cable works to the need for more care.

Cards and pamphlets have been prepared and a wide distribution will be made to ensure that each member of the Post Office staff concerned is reminded individually of the need to take extra care to protect service. An important consideration in preparing the publicity material has been to ensure that individual staff groupings should not appear to be selected for criticism or blame for past failures.

Many arduous tasks have had to be performed in extremely difficult situations in the past few years and, without doubt, conditions will not be any easier in the near future. It is proposed that Regional and Telephone Area supervising officers should follow up the distribution of the publicity material by explanatory talks to small groups of the field staffs, the principal aim being to achieve a really co-operative effort towards better serviceability.

A BIGGER AND BETTER TRAINING SCHOOL

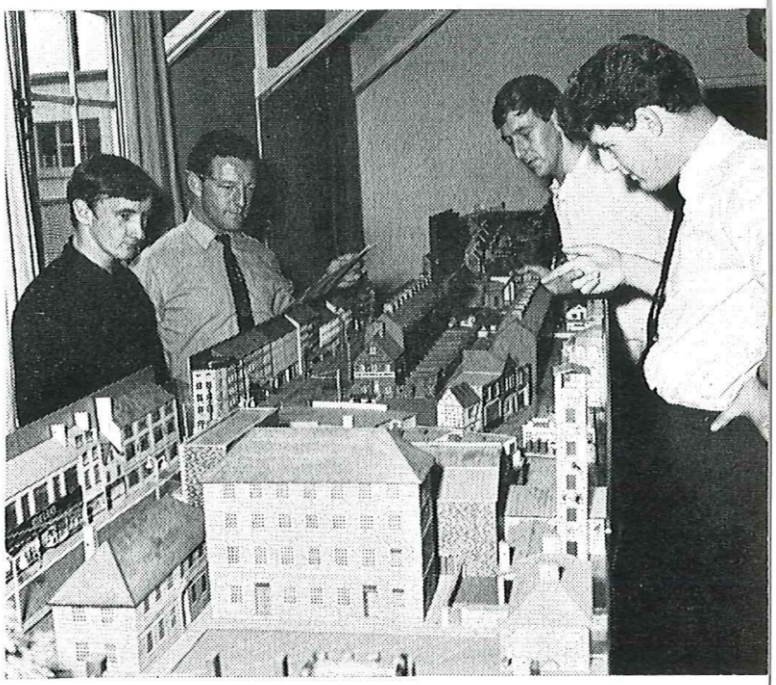
Plans are going ahead to develop the Engineers Central Training School—already the biggest of its kind in the world—to cater for 1,000 students at a time

By C. E. WOOLLEY

THE abbreviation CTS has several meanings in the Post Office but to most engineers it means the Central Training School at Stone, in rural Staffordshire, where many thousands of engineers have gone in the past 21 years to learn the secrets of their trade.

The story of the CTS begins at the end of World War Two. Until then, centralised training courses were held in London at King Edward Building and subsequently at Dollis Hill Research Station and at Cambridge. However, this accommodation proved inadequate for the task of retraining those who had been away on military service and who required to catch up on their training. To meet this requirement a sizeable residential school was needed. Since it was clearly impossible to put up new buildings in time to house a school, a home was found at Stone in a group of single-storey hostels, originally associated with a large Ordnance factory. One hostel became Howard Hall Hostel and two others were adapted to provide 150 self-contained family bungalows for the teaching and ancillary staff.

Soon 500 students were in residence and ever since training has continued there every week of the year except Christmas week. Since then, some 150,000 students, including many hundreds from overseas, have visited Stone to profit from the wide and ever-changing variety of courses.



"Here's part of a typical big town. How would you plan the local telephone network?" Students work out the problems on this school scale model.

At present more than 130 different subjects are listed in the School's prospectus, covering almost all aspects of engineering work. The techniques used to maintain telephone exchanges and repeater stations, underground cables, microwave radio links, teleprinters and postal machinery are all taught, side by side with the methods of designing local cable networks or heating and ventilating systems.

The courses range from one to six weeks and are designed so that progressive levels of skill are

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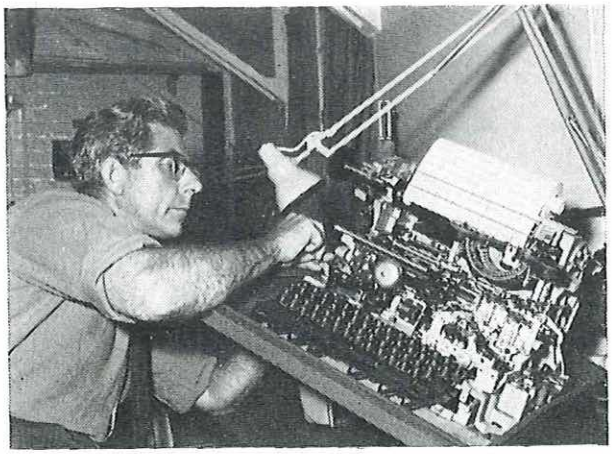
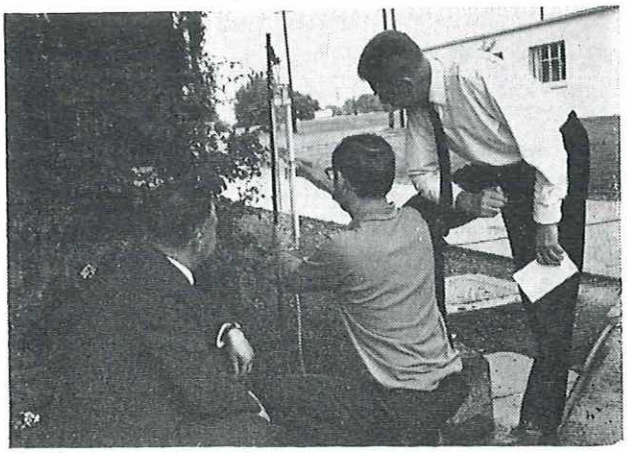
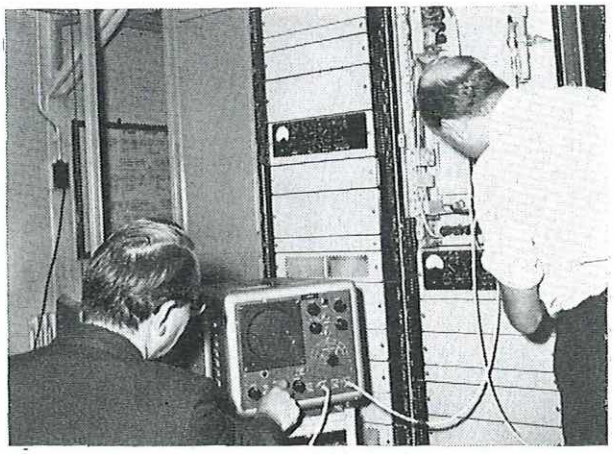


Technical Officer A. J. Johnson masters the intricacies of the new teleprinter No. 15 which he will soon be maintaining in LTR.



Cable testers learn how to use a mercury manometer to localise a fault on a coaxial cable system—part of their cable maintenance training.



Two students line up a 6,000 MHz microwave link in the School's radio laboratory.

Safety-helmeted maintenance engineers are shown how a lift motor brake operates.

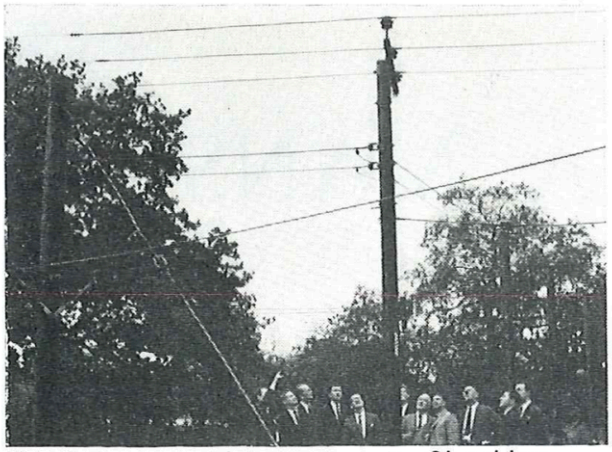
reached by attending a succession of courses over several years. The advantage of this arrangement over "once-for-all" initial instruction is that overall training can be more closely matched to particular jobs. An appropriate sequence of courses can also be selected at suitable times to avoid wasteful redundancy. Short courses also have the merit that knowledge is absorbed far more effectively when it is taken in small doses and then later consolidated by repeated application. For mature students there are obvious attractions in a scheme which limits the length of individual absences from home, even at the cost of being away on several occasions.

In the mid-1950s the first steps were taken towards establishing a permanent training school and in 1961 planning began in earnest to determine the requirements for a new establishment.

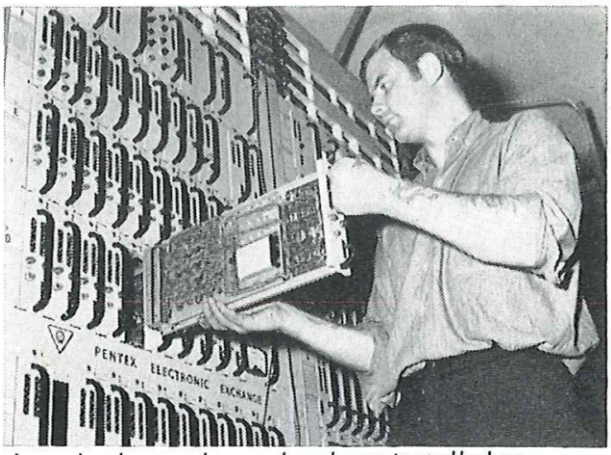
By this time the average student population was about 450. It was decided that a sensible capacity for planning purposes was 600. A joint working party was set up and, by 1964, every aspect of the School had been examined. Criteria had been established for all the peculiar features of a residential college, a site was acquired at Harlow New Town and buildings were designed to fit the site.

At this stage misgivings arose about the size of the new buildings. During the design period there had been a considerable upsurge in demand for training, arising partly from the unprecedented growth of the system and partly from the introduction of new techniques and services. The opening of the Engineering Management College at Bexhill had relieved the CTS of some commitments, but a careful and continuing review showed that the 600 places which had been envisaged would not be enough and that unwelcome expedients would be called for at a very early date. Reluctantly, it was decided to abandon the project, which could not be expanded sufficiently on the land available, and to replace it by redeveloping the existing site at Stone.

Plans are now being worked out to erect an

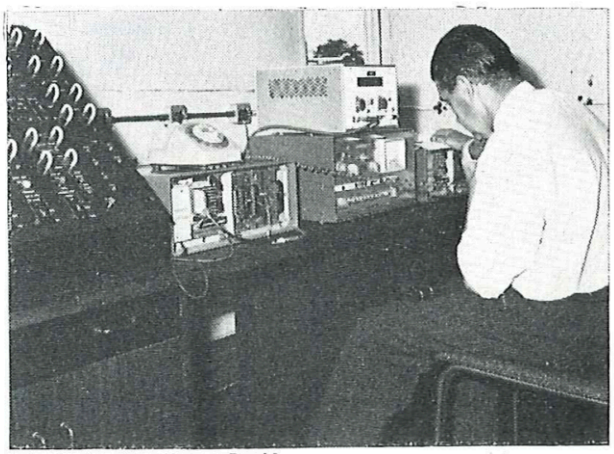


AEE R. Lawton explains to a group of local line planning engineers a joint construction scheme for telephones and 11 kV power lines.



A reed relay exchange has been installed so that maintenance techniques can be learned without the risk of interrupting live traffic.

The technical library helps to keep both staff and students abreast of new developments.



Technical Officer R. Katon practices setting up the terminal equipment for Datel 600 apparatus.

Engineering Training College of about 1,000 student places, based largely on the standards for the earlier project. Since the work of the School cannot be interrupted and new buildings will have to be sited to some extent where others exist at present, the building programme will have to be phased over some few years. It is hoped, however, that the first instalment will be ready by about the end of 1968. This will consist of a three-storey block of training rooms for about 300 students—as an advance part of the training buildings—and 432 bedrooms also of three-storey construction in the form of linked houses with eight bedrooms on each floor. Each student will be housed in a single room of good standard.

Meanwhile, pressures have already overtaken the resources of the CTS. By the middle of last year it became apparent that it would not be possible to wait for completion of the permanent buildings without incurring serious penalties in the form of postponement of training, for which there was increasing demand. To bridge the gap, solutions have been found to the twin problems of increasing sleeping accommodation and teaching space—the former mainly by converting some little-used recreational space to bedrooms and the latter by adapting some disused World War Two offices about a mile away.

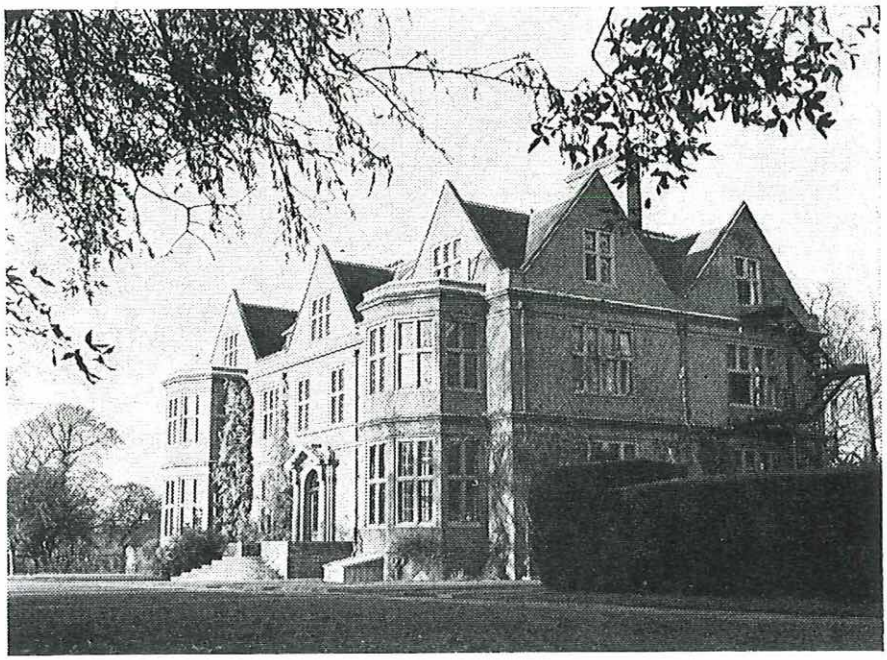
The new premises are being used mainly for instruction on reed relay and crossbar telephone exchanges and on PABXs. Some 750 students are now catered for in what is probably one of the largest industrial training establishments in the world which can look with pride at a growing number of similar establishments—in Africa and the East—whose practices and methods derive in no small measure from those of the Engineering Department's Central Training School.

THE AUTHOR

Mr. C. E. Woolley *is Deputy Principal of Stone Central Training School where he has worked since 1957. Before taking up this appointment he was transmission efficiency officer, Nottingham Telephone Area.*

COLLEGE IN A MANSION

By B. J. EASTERBROOK, C.Eng., MIEE



Horwood House, once a school and then a British Rail study centre, is now a training college for engineers.

THE HORWOOD House Estate, at Little Horwood, near Bletchley, Buckinghamshire, was acquired by the Training Branch of the Engineering Department in September, 1966, in order to centralise and meet increasing training commitments. It comprises an attractive Elizabethan-style mansion with a stable block and other buildings, including five bungalow or cottage residences, standing in 38 acres of mainly parkland and surrounded by a tenanted farm of 144 acres.

The house was built in 1911 as a private residence and was subsequently used as a school and then as a residential works study college by British Rail.

Adaptations to the property have now been completed to provide offices, lecture rooms, laboratory and residential accommodation for 48 students. Twenty-two new bedrooms have been constructed in the stable block, with the minimum disturbance to its main external architectural features, which include a 'Norfolk' thatched roof. Large rooms on the upper floors of the house have been partitioned to provide single bedrooms throughout.

The work of adapting the stable block began in January, 1967, and the college opened to the first 27 students on the 6 March. Only 18 bedrooms were available at that time and the extra students were accommodated overnight at the Regional Training School, Bletchley. Help from Eastern Region in this and many other ways enabled the college to function at a 32-38 student level before the remaining bedrooms became ready during the summer. The small minority of students who do not return home are accommodated at week-ends at the Regional Training School.

The college provides training for Executive

Engineer and Assistant Executive Engineer competition entrants, Student Apprentices and sandwich course students. Job conference-courses for Area first and second-line engineering supervising officers which deal with organisational and technical methods on particular main types of work for maximum profit and service, are also being given.

Open Competition Assistant Executive Engineers normally spend a year on Area training before taking up their assignments. During this time they attend six one-week courses at the college spread at approximately equal intervals throughout the year. At such courses the students are briefed on particular aspects of area work for their next field training period. Open and limited competition Executive Engineers and limited competition Assistant Executive Engineers normally attend a one-week induction course immediately on appointment and this is followed by a period of up to three months field training, designed to fit each man for his particular post.

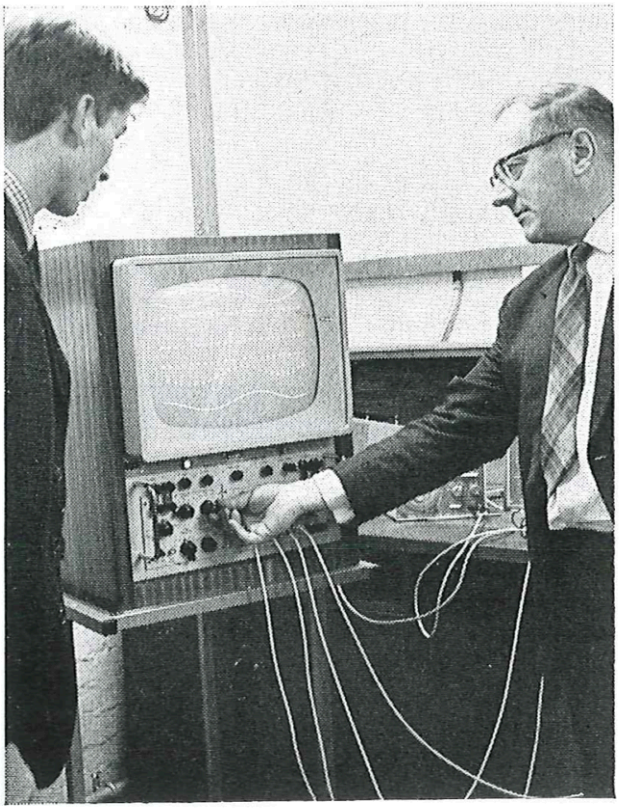
New entrant Student Apprentices start in September and spend one year on Post Office training before beginning a full time degree course. They attend a one-week induction course at the college, followed by a three-month period of workshop and drawing office training at either the Research Branch, Post Office Factories' Department, a contractors' works or a technical college. They have a further one-week briefing course before starting Area field training. They also attend the college at quarterly intervals throughout the year for two-week academic courses designed to stimulate and maintain their interest in electrical and mathematical theory and provide a good groundwork for their university studies.

Additionally, during this pre-university year the students undertake a four-week course at the College, covering the design of simple electronic circuits and the use of laboratory equipment, to assist them in tackling project work which they may undertake during their subsequent vacational periods.

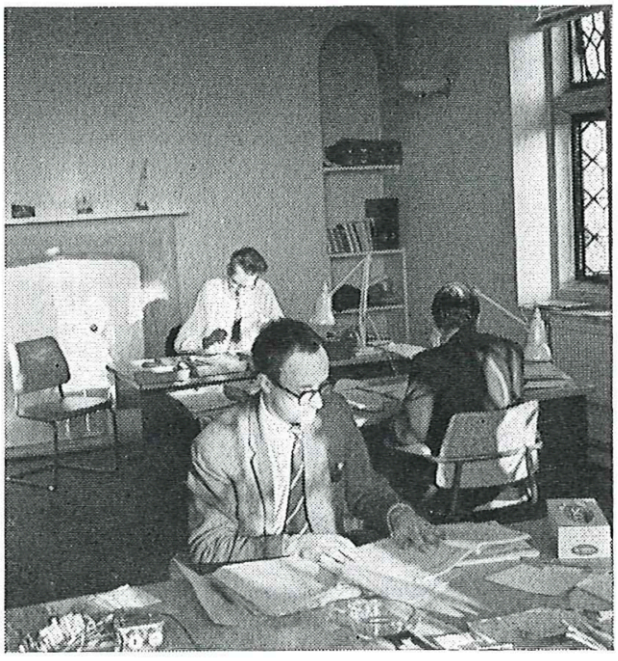
Sandwich course students, who have the equivalent of two years industrial training during their four years' degree course, spend their first industrial period on workshop and drawing office training and attend the four weeks' laboratory course as for Student Apprentices, again to fit them for later project work.

As well as running these courses the tutors plan and control the training programmes for all

OVER



Above: Tutor Mr. A. E. Stokes demonstrates waveforms to a Student Apprentice. Below: The tutors' office—Elizabethan style.



students and keep a close watch on their progress. About 425 students are 'on the books' at any one time. With increased recruitment and scholarships, this figure is growing. Progress is assessed from information from reporting officers during each phase of training, from projects and students' own reports, and from discussion with students at the college. These types of feedback are supplemented in the case of sandwich course students by an exchange of information with the university tutors responsible for overseeing the students' industrial training.

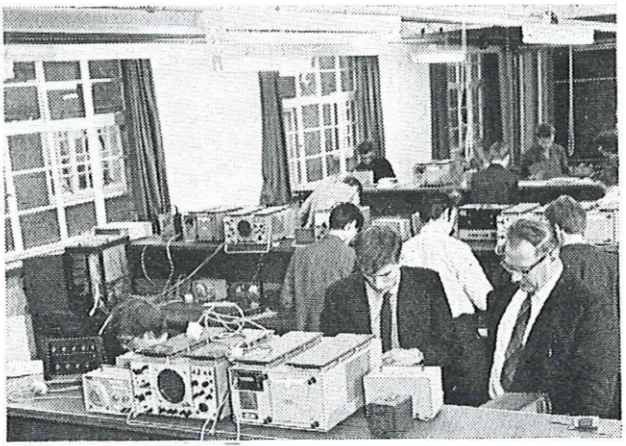
The usual range of indoor recreational facilities, including table tennis and billiards, is provided. There is a playing field, and tennis courts and a pitch-and-putt golf course should be available later. Catering and domestic arrangements are in the hands of a resident domestic bursar, who has a small daily staff, two or three of whom live in one of the College's Cottages.

The Principal lives in a bungalow on the College site and the two entrance-lodge cottages are occupied by members of the staff.

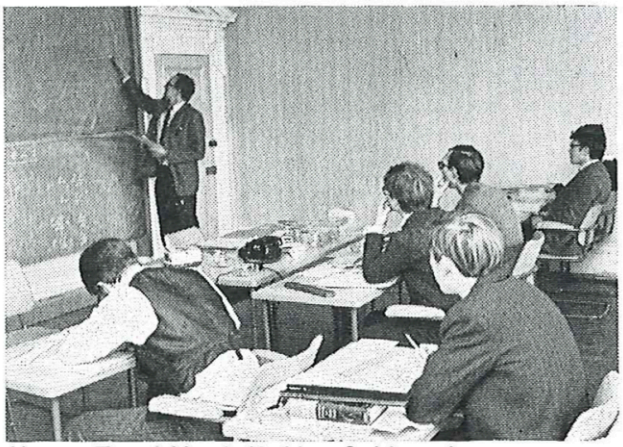
The early establishment and successful operation of the college is largely due to the enthusiastic team effort of all the staff. The College has also been fortunate in enjoying the speedy and efficient co-operation of those involved in building adaptations, providing heating and lighting services, decorations, furnishing and staffing—Headquarter Departments, Eastern Region, Oxford and Bedford Telephone Areas, the Ministry of Public Building and Works and contractors.

THE AUTHOR

Mr. B. J. Easterbrook, *Principal of Horwood House College since January, 1967, joined the Post Office as a Youth-in-Training in 1947. Until his present appointment he was attached to the Post Office Research Station at Dollis Hill.*



Above: A student class at work in the laboratory. Below: Student Apprentices go back to school—among them Miss Paula Godsmark, the first girl Student Apprentice to be recruited.



Above: Tutor Mr. J. K. Hearfield explains a knotty point to Student Apprentices. Below: Off duty in the lounge. The new College also has recreation rooms and a playing field.

MISCELLANY

At the prize giving. Left to right: Mr. J. K. Perkins, Mr. W. J. Bray (Director of Research), Sir Gordon Radley, Mr. R. J. Eddy, Mr. K. W. N. Bilton and Mr. R. D. Enoch.

CHRISTOPHER COLUMBUS PRIZE WINNERS

Sir Gordon Radley, former Director General of the Post Office, presented awards to the winners of the Post Office Research Branch's Christopher Columbus Prize Fund.

The winner of the Scientific Premium was Mr. R. D. Enoch, a Senior Scientific Officer in the Materials Division. His article—*High Magnetic Permeability in Ni-Fe Alloys*—which describes original work carried out in the Research Department as part of a large programme on magnetic alloys, was adjudged the best of the written papers.

First prize in the Craftsmanship Premium Section went to Mr. J. K. Perkins, Temporary Technical Officer in the RG (Submarine Transmission Systems) Division. His entry was a set of tools made on the hand and machine tools training courses at Dollis Hill. Second prize was divided between Mr. R. J. Eddy of RWS (Radio Systems) Division at Castleton and Mr. K. W. N. Bilton, of RA Division (Research Services).

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Mr. B. Smith, a Technical Officer from Lincoln, won the first prize of £7 7s. and a Certificate in the Institution of Post Office Electrical Engineers' 1966-67 *Associate Section Papers Awards competition. The second prize of £4 4s. and a Certificate went to Mr. R. C. Siddle, Technical Officer at Bradford Centre, and an additional award of one guinea and a Certificate to Mr. D. Campbell, a Technical Officer from Middlesbrough.*

POST-GRADUATE AWARDS

Six members of the Post Office Engineering Department were recently granted post-graduate awards, tenable at universities with facilities for research or advanced studies in telecommunications science and engineering, to carry out further research and develop expertise of special value to the Post Office.

They are: Mr. J. H. Fletcher (one year award for automatic control systems course at Imperial College, London); Mr. R. Hanks (one year award for chemical engineering course at University College, London); Mr. P. James (one year award for electronic circuit and systems engineering course at Bath University of Technology); Mr. B. L. Nuttall (one year award for a systems engineering course at the University of Surrey); Mr. T. F. Smith (a three year award to study economic and information-theory aspects of general purpose telecommunications systems at the University of Essex); and Mr. P. A. Watson (a one year award for final year of a Ph.D. course at Durham University on parametric amplifiers for use in satellite earth stations).

Most awards will enable the holders to qualify for M.Sc. or Ph.D. degrees.

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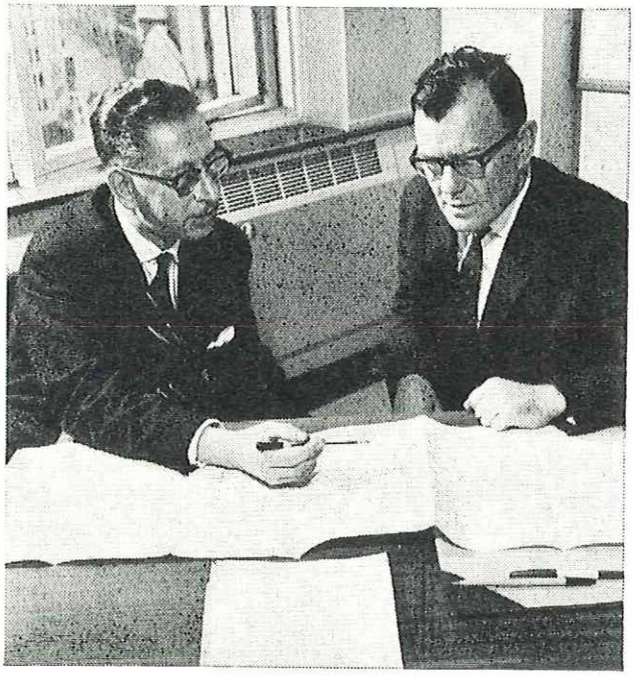
PCM Comes to London

The operational use of Pulse Code Modulation, which allows up to 24 *telephone conversations to be carried over two pairs of wires, was introduced in London on* 27 *November. On that day PCM circuits were brought into operation between Sunbury-on-Thames and Faraday Building in central London.*

The PCM system will shortly be extended between central London and a number of exchanges in south London—Redhill, Caterham, Esher, Weybridge, Ashford, Walton and Staines. Later, a further 36 *PCM groups will be provided from Faraday Building and Holborn Exchange to exchanges north of the Thames—Uxbridge, Watford, Potters Bar and Welwyn Garden City. Equipment for another* 160 *PCM groups, costing more than £1 million, is planned for installation in* 1968 *between central London and more far-distant exchanges, including Dartford, Gravesend, Epsom, Dorking, St. Albans, Romford and Hornchurch.*

The Company Representative Scheme

By R. W. CLARKE



A new era in customer relationships is heralded by the appointment of Post Office liaison officers to handle the telecommunications businesses of five large organisations

Mr. R. Hatch (left), Post Office representative appointed as liaison officer to the Central Electricity Generating Board in London, discusses telecommunications problems with Mr. J. Ross, the telecommunications planning engineer with the CEGB.

AS the size and complexity of commercial and industrial undertakings grow so, too, do the telecommunications services required to meet their needs.

The Post Office provides these services on a national scale but it necessarily operates by devolution and delegation so that the normal point of contact between the customer and the Post Office is in the Telephone Area.

Increasingly, a number of organisations who also operate on a national scale, are appointing communications managers to co-ordinate their requirements and use of telecommunications services—a welcome recognition of the vital importance of telecommunications to industry and business.

Obviously, the Post Office has a duty to help these communications managers as much as possible and it is with this aim in view that an experiment—called the Company Representative Scheme—is now being carried out in London, Stoke-on-Trent and Manchester.

The main objective of the scheme is to give the Post Office's larger customers a much more efficient service than they have had in the past and to promote the sale and use of all telecommunications facilities. To achieve this aim, company representatives have been appointed to act as liaison officers with five of the Post Office's biggest customers who each have a communications manager: the Central Electricity Generating Board, in London; the English Electric Co., Ltd., in Stoke-on-Trent; the Exchange Telegraph Co. Ltd., in London; the Ford Motor Company, at Dagenham and Imperial Chemical Industries Ltd., in Manchester.

Each company representative is established in the telephone area where the firm's communication manager is based. He will handle all the telecommunications business for the company, no matter where the installation may be, except for the minor day-to-day alterations which will continue to be dealt with by the local Telephone Manager's Office.

He will familiarise himself with the organisation and its special needs, keep up-to-date with new telecommunications developments and take special steps to promote the sales and use of telecommuni-

These are the four other Post Office company representatives. Left to right: Mr. A. E. Thompson (with English Electric Co. Ltd., Stoke-on-Trent); Mr. P. J. Stuart-Innes (Exchange Telegraph Co. Ltd., City Area); Mr. A. Miller (Ford Motor Co., East Area); and Mr. H. Bond (Imperial Chemical Industries Manchester).

cations facilities and services. He will also ensure that the needs of the company are given proper attention at all times, liaising with other specialist grades as necessary but not usurping their particular responsibilities.

Not least of the advantages of this scheme will be the development of a more commercial relationship between the Post Office and its customers and the building up of the knowledge among customers that the Post Office is anxious to do business with them and to do it well.

The success of this venture will largely depend on the support and understanding that the company representative is given outside his home territory. It is implicit that no one will be committed to action for which he is responsible without prior consultation and agreement. But once this has been done, every one will have to ensure that his contribution is fully subscribed, in time and content, otherwise the whole scheme could be in jeopardy. The reputation of the Post Office would suffer and that of the company representative would be still-born.

Regions and Areas have been consulted, brought into the planning and made their contributions to the design of the Company Representative scheme. There are pitfalls to be considered, and there will be teething troubles to overcome, but the Post Office is satisfied that with goodwill and endeavour it has a sound basis for developing a much more efficient and cordial relationship with its big customers.

Some support and co-ordination at Headquarters is equally vital to the scheme. To meet this, a small team has been set up in ITD, Marketing Branch. Through normal administrative channels and, exceptionally direct, as appropriate, this team is available for advice and guidance whenever required. The Headquarters team is also responsible for the administration of the scheme and will evaluate the results of the trial.

The first five company representatives have been appointed in consultation with the Regions and Areas concerned. It may be useful and necessary to appoint more representatives during the experimental period.

One of the most essential and, perhaps, most difficult features of an experiment of this kind is to measure results. For this reason very detailed monthly returns are being made. These, together with the comments of Regions, Areas and the customers concerned, should produce firm guide lines for future action.

The Post Office believes that the new scheme will mark the introduction of a new era in customer relationships that has come to stay.

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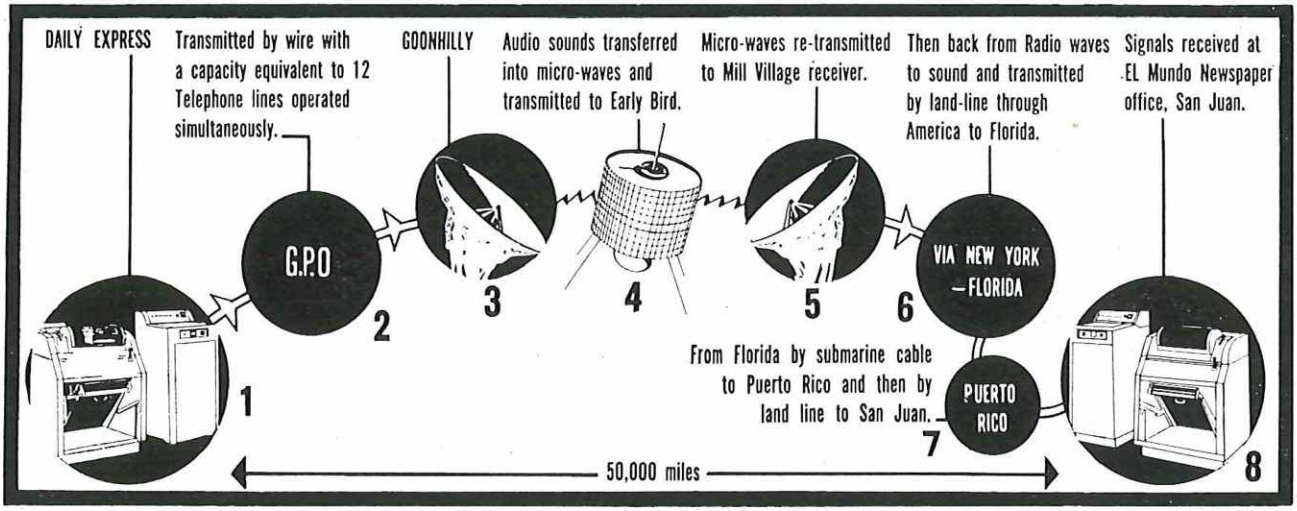
All Staff up to and including Technical Officers are eligible to enter the Institution of Post Office Electrical Engineers' Essay Competition, 1967-68. The subject can be anything connected with telecommunications. Each essay should be between 2,000 and 5,000 words.

Closing date for the competition is 15 January, 1968. Entries should be sent to: The Secretary, The Institution of Post Office Electrical Engineers, GPO, 2-12 Gresham Street, London, E.C.2.

THE FRONT PAGE WENT BY SATELLITE

By D. C. GORING



This artist's drawing shows how the front page travelled from London to Puerto Rico by Early Bird.

THE art of transmitting pictures and diagrams over wires and radio circuits has developed steadily over the past few decades.

Generally, ordinary telephone circuits are used and the speed of transmission of a picture is necessarily slow. More recently, however, means of higher speed transmissions over bandwidths normally occupied by a group of 12 telephone circuits (48 kHz) or supergroup of 60 telephone circuits (240 kHz) have become available and have opened up new opportunities for transmitting large quantities of printed material. The *Daily Mirror*, for example, regularly transmits a 32-page issue from its Manchester office to its Belfast office and prepares a printing plate from the received negative.*

Fired with enthusiasm for this new technique and seeking to be first in the field, the *Daily Express* recently asked for a demonstration which would involve sending their front page ready for printing in the local newspaper at San Juan, Puerto Rico. They also wanted to supply the British representative of the International Press Association with a copy for presentation at their annual meeting in San Juan on 17 October, 1967.

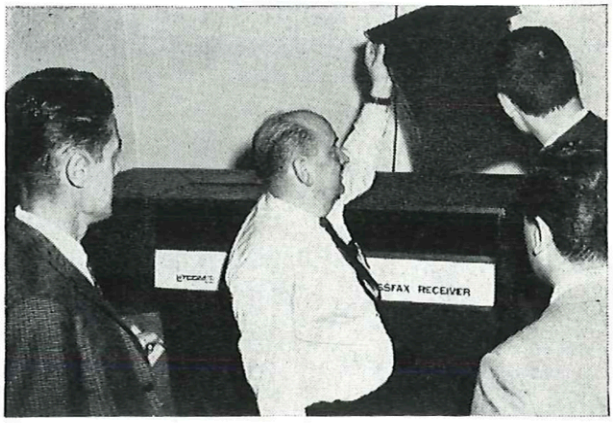
The Post Office was naturally interested in contributing to a new era in press communications and, after discussions with the many interested parties on both sides of the Atlantic, arrangements were made to provide a wideband (48kHz) circuit by way of the *Intelsat* 1 (*Early Bird*) satellite.

Intelsat 1 was normally operational between 1200 and 2400 GMT but, by bringing it into operation at 0700 GMT on 17 October there was no interference with the services normally routed via the satellite and sufficient time was available to prepare copies of the *Daily Express* front page to be presented at the annual meeting on the same day and for local newspaper, the *El Mundo*, to print in the next morning's edition. (San Juan is five hours behind London time).

Using Muirheads' facsimile transmitter working at a speed of 500 revolutions a minute, signals

* *See Summer* 1967 *issue of Telecommunications Journal.*

The Post Office played a big part in demonstrating how the entire front page of a newspaper can be transmitted 50,000 miles by satellite, ready for printing just a few hours later at the receiving end



Above: A Daily Express *picture telegraphist loads a page proof on to the drum of the transmitter. Right (top): Less than 20 minutes later in the offices of* El Mundo, *a photo-sensitive film is made of the front page and (bottom) two model girls in San Juan read the very latest news from London.*

were sent from London over a 48 kHz circuit to the Post Office earth station at Goonhilly Downs; then by way of *Intelsat* 1 to the Canadian earth station at Mill Village, Nova Scotia; then by Canadian Overseas Telecommunications Corporation circuits to the United States border; and finally, by American Telephone and Telegraph Company landline to West Palm Beach, Florida and on to San Juan by a submarine cable jointly owned by the American Telephone and Telegraph Company, and the International Telephone and Telegraph Corporation.

The signals were picked up by two facsimile receivers—one supplied by Litton, an American firm, the other by Muirheads of the United Kingdom. The transmission time for one page was about 12 minutes. Competition between the two firms was amicably resolved. Muirheads used the web offset printing process to reproduce the page for the delegates at the annual meeting and Litton's page, using the letterpress process, was reproduced in the next day's issue of *El Mundo*.

The transmitted page included a picture of Julie Christie in a windswept miniskirt. This is reported to have caused as big a sensation among delegates' wives as the space age *Daily Express*

OVER

did to the delegates. The report from San Juan said that "the project was a tremendous technical achievement and a marvellous public relations boost for the *Daily Express* and Julie Christie throughout North and Latin America."

A project of this nature calls for very close liaison and the undoubted success of the demonstration reflects the high degree of co-operation which exists between telecommunications personnel the world over.

THE AUTHOR

Mr. D. C. Goring, *at present on loan to the Ministry of Defence (Navy) Department, is a Senior Telecommunications Superintendent in the External Telecommunications Executive. He joined the Post Office as a Youth-in-Training in 1943 in the Bedford Area.*

GPO speeds the press messages

These men are the link between the Post Office and Fleet Street on all overseas telegraph matters. Left to right: Mr. Frank Burnell, Assistant Press Liaison Officer (seated), Mr. Alex Downing, Mr. Ted Luttrell, the Press Liaison Officer, and Mr. John Petyt.

PRESS messages between Fleet Street and overseas countries have been further speeded by the setting up in Electra House, London—the world's biggest telegraph station—of a special Press Unit.

Under the new system all press traffic will be taken out of the main telegraph stream and handled separately in the one unit which is linked to newspaper offices by private teleprinter circuits and by telex and telephone. To give journalists easy access to the new Unit, a number of special dialling codes have been arranged and to many countries overseas transmission will take place direct from the Unit either by Gentex, to the rest of Europe, or through the Post Office Message Relay Centre.

The Post Office's mobile telegraph office which travels the country to provide an overseas press service from sporting events and the special events offices at Wimbledon, Marlborough House and at party political conferences will in future be linked to the new Press Unit. Direct lines are being arranged from special overseas events, such as the Olympics and MCC tours, into the Press Unit for immediate onward transmission to newspaper offices.

The new Press Unit will also have a library in which copies of all messages despatched and received will be kept so that inquiries can be answered more rapidly.

●

New telephone services were opened on 4 December between Britain and the Seychelles and Britain and the Falkland Islands.

Telecommunications Statistics

	Quarter ended 30 June, 1967	Quarter ended 31 March, 1967	Quarter ended 30 June, 1966
Telegraph Service			
Inland telegrams (including Press, Railway Pass, Service and Irish Republic)	**2,257,000**	2,152,000	2,594,000
Greetings telegrams	**548,000**	568,000	603,000
Overseas telegrams:			
Originating U.K. messages	**1,760,000**	1,693,000	1,816,000
Terminating U.K. messages	**1,767,000**	1,682,000	1,803,000
Transit messages	**1,667,000**	1,510,000	1,451,000
Telephone Service			
Inland			
Net demand	**177,000**	184,000	228,000
Connections supplied	**180,000**	183,000	200,000
Total orders in hand	**217,000**	221,000	255,000
Total working connections	**7,024,000**	6,932,000	6,658,000
Shared service connections (Bus./Res.)	**1,359,000**	1,355,000	1,324,000
Effective inland trunk calls	**253,156,000**	235,219,000	227,196,000
Effective cheap rate trunk calls	**55,104,000**	49,975,000	51,636,000
Overseas			
European: Outward	***2,364,000**	2,221,000	2,050,000
Extra European: Outward	***205,000**	199,000	190,000
Telex Service			
Inland			
Total working lines	**20,000**	20,000	18,000
Metered units (including Service)	**52,706,000**	54,484,000	53,093,000
Manual calls (including Service and Irish Republic)	**29,000**	30,000	24,000
Overseas			
Originating (U.K. and Irish Republic)	***3,520,000**	3,412,000	3,003,000

*Estimated figures. Figures rounded to nearest thousand.

Publication and Price. The *Journal* is published in March, June, September and December, price 1/6. The annual postal subscription rate is 6/6 to any address at home or overseas.

Contributions. The Editorial Board will be glad to consider articles of general interest within the telecommunications field. No guarantee of publication can be given. The ideal length of such articles would be 750, 1,500 or 2,000 words. The views of contributors are not necessarily those of the Board or of the Post Office.

Correspondence. Communications should be addressed to the Editor, Post Office Telecommunications Journal, Public Relations Department, GPO Headquarters, St. Martin's-le-Grand, LONDON, E.C.1. Telephone: 01–432 4345. Remittances should be made payable to "The Postmaster General" and should be crossed "& Co.".

GPO

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Spring 1967—Winter 1967

ALPHABETICAL INDEX

GROUP INDEX

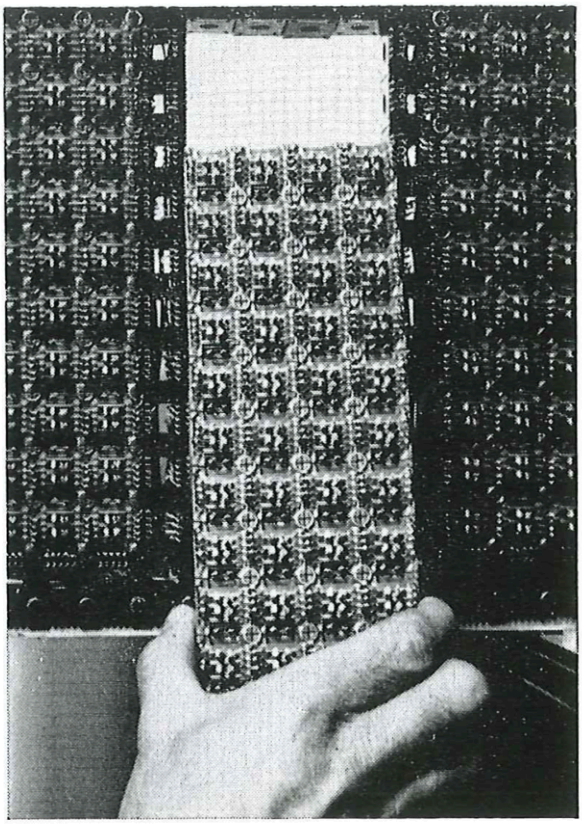
* *"Technical articles of a page length or over, appearing in* Telecommunications Journal *are also indexed in the* British Technology Index *seven or eight weeks after publication in the Journal."*

REX®

THE REED ELECTRONIC EXCHANGE

No. 18 system

packs more lines into less space— AND LEAVES ROOM FOR UNLIMITED EXPANSION



REX in a nutshell

By providing electronic common control of reed relay spatial switching, the REX system offers an extremely compact and reliable solution to both the switching and control problems of modern exchange design. The REX exchange has been developed by AEI to integrate smoothly with existing automatic networks: its exceptional flexibility ensures full growth capacity for both services and traffic . . .

Wider range—more accessibility

An entirely new Reed & Electronic Modular Apparatus practice (REMA) has been designed by AEI engineers to provide completely compatible mounting of reed relays and electronic circuit components. Combined with a new sliding-frame mounting system, the REMA practice allows more than 20,000 lines of REX switching equipment to be accommodated in the space normally required by a 10,000 line electro-mechanical exchange. In existing buildings this means more space for future expansion: in new exchanges it makes possible great savings in construction and installation costs. And because the REX subscriber's line circuit can tolerate substantially wider line conditions, a REX exchange will serve an area much larger than that of a conventional exchange, with significant reductions in line plant investment.

Designed for expansion

The basic design allows for all future switching requirements, including abbreviated dialling and subscriber's automatic transfer, together with all current standard features such as data for automatic message accounting. A stored programme control is provided to expedite inclusion of these and any other special facilities that may be required during the life of the exchange with virtually no redundancy of initial apparatus.

Minimum maintenance

The high-speed electronic control system is programmed to give complete automatic self-checking and self-reporting of fault conditions and at the same time, routes calls away from areas of faulty equipment. A 3,000 (ultimately 7,000) line prototype reed electronic exchange supplied to the BPO at Leighton Buzzard,* has been designed for completely unattended operation and reports all servicing requirements to a remote maintenance control centre.

Maximum service security has been ensured by exhaustive circuit design and testing during the development period and by replication of important items of equipment. The control area is sub-divided into independently switched functional units thus ensuring continued operation in the face of faults. Thanks to the REMA system every part of the REX exchange is accessible for inspection or servicing.

* *Developed in conjunction with the BPO under the auspices of the Joint Electronic Research Committee.*

SOPHISTICATED ELECTRONICS— BUILDING BLOCK SIMPLICITY!

The REX switching element

The basis of the REX system is the reed-relay switching element. It contains only nine different piece parts, compared with 200 in a bi-motional selector, and its very simplicity makes it uniquely reliable. There's nothing to wear out and it is sealed completely against dust and atmospheric pollution.

The REX switching matrix

Switching matrices can be built up in any form simply by clipping reed-relay crosspoints together. Thus unlimited provision for the growth of lines and links is built into the REX system.

The REX switching unit

Basic switching arrays are built up out of matrices and are arranged in parallel to form a REX switching unit. Typically, a 1,000-line four-section unit would serve a community with an average calling rate of 150 call seconds per line in the busy hour; other calling rates can be accommodated by varying the number of sections.

The multi-unit REX exchange

Switching and linking arrangements are provided for all sections of each unit so that complete crosspoint path interconnection is made between all lines of the REX exchange. The special linking pattern adopted can cater for all traffic patterns whilst retaining simplicity of control.

REX electronic control

The REX electronic control has three main areas of activity:
Scanners and Registers: To determine the source and final destination of a call.
Markers and Interrogators: Concerned with interrogating the state of crosspoint paths and marking these paths through the switching sub-units.
Common Control: Processes the necessary call setting data in accordance with instruction from the stored programme control so that the calls are routed with maximum utilisation of the switching networks.

Information for administrations

The AEI REX Information Service is one of the most comprehensive programmes ever offered. In addition to brochures and full technical data, AEI will gladly arrange for their lecture team to visit the engineering staff of interested administrations to provide an introductory course on basic REX principles. Later, key personnel would receive full training both at AEI's UK factories and on-site during installation. Training schools staffed and maintained by AEI are also under consideration for territories where reed electronic exchanges are proposed as standard.

Please write for full details

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AEI TELECOMMUNICATIONS

67/TG/PD4/A

The Post Office Telecommunications Journal is printed for Her Majesty's Stationery Office by the Swindon Press Ltd., Victoria Road, Swindon, and is published quarterly in December, March, June and September by H.M. Postmaster General at the Post Office Headquarters, London, E.C.1.

μικρός

the Greeks had a word for (part of) it

The ancient Greeks used the word **'μικρός'** (or 'micros'), meaning small, long before microwave equipment had been dreamed of. Today, modern Greece is served by up-to-date microwave radio links in which equipment made by G.E.C. (Telecommunications) Ltd., of Coventry, England, plays a leading part.

The most recent example is the 450-mile (730 km) system between Dholiana, on the mainland, and the island of Crete. The Hellenic Telecommunications Organisation have specified G.E.C. 6000 MHz equipment for the main route. Optimum use of semiconductor techniques ensures increased reliability, reduced power consumption, and minimum maintenance requirements. Two r.f. bearer channels, one working and one standby, will each have a capacity of 960 telephone circuits with automatic changeover in the event of degradation of the signal below a predetermined level. This route can be extended, when necessary, to a total of three working channels and one standby. In addition a seperate auxiliary radio equipment, also operating in the 6000 MHz frequency band, provides 60 telephone circuits for intermediate stations independently of the main through traffic and also a bearer circuit for a supervisory order-wire and remote control and alarm facilities.

On Crete, the spur routes will be equipped with completely semiconductored 7500 MHz radio equipment operating on a 'twin-path' basis with a capacity of 300 telephone circuits.

G.E.C. microwave systems already link Patras with the island of Corfu, Athens with Mount Parnis and the island of Syros, and Larissa with Mount Pillion.

G.E.C.

Takes telecommunications into tomorrow

G.E.C. (Telecommunications) Ltd., of Coventry, England.

18/19